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Key Words

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A home education program for older adults with hearing impairment and their significant others: A randomized trial evaluating short- and long-term effects

Un programa de educación hogareña para adultos mayores con trastornos auditivos y su acompañante significativo: un estudio aleatorio para evaluar efectos a corto y largo plazo

Abstract

This paper addresses the development and effectiveness of a home education program. The program, designed for hearing-impaired elders and their significant others (SO), deals with communication strategies and speech reading. Participants were randomly assigned to a training group (hearing aid fitting+home education program) or a control group (hearing aid fitting). The training group included 24 hearing-impaired subjects and 24 SO's. Controls were 24 affected individuals and 22 SO's. Questionnaires addressing emotional response, communication strategies and the IOI-HA, IOI-AI and IOI-SO were used. A repeated measures analysis of variance was applied to test group differences between pre, post, and 6-months follow-up measures. Increased awareness of benefits of speech reading and improved interaction with the SO were observed in the training group only ($p < 0.05$). No group difference on 'emotional response' was found. IOI-AI and IOI-SO demonstrated favorable attitudes towards the program. Follow-up measures showed improved quality of life and satisfaction in the training group, while a decrease was observed among the controls ($p < 0.05$). Some effects differed between first-time and experienced hearing aid users. Addition of services to amplification and involvement of the SO are relevant in aural rehabilitation.

Sumario

Este trabajo se ocupa de evaluar el desarrollo y la efectividad de un programa hogareño de educación. El programa, diseñado para ancianos con problemas auditivos y su acompañante significativo (SO), tiene que ver con estrategias de comunicación y con lectura labio-facial. Los participantes se asignaron al azar a un grupo de entrenamiento (adaptación de auxiliares auditivos+programa hogareño de educación) o a un grupo control. El grupo de entrenamiento incluyó a 24 sujetos hipoacúsicos y a sus 24 acompañantes significativos (SO). Los controles fueron 24 individuos afectados y 22 SO. Se utilizaron cuestionarios evaluando respuesta emocional, estrategias de comunicación y las pruebas IOI-HA, IOI-AI y IOI-SO. Se aplicó un análisis de variancia de medidas repetidas para las diferencias de los grupos en las medidas pre y post-evaluación y en el seguimiento a los 6 meses. Se observó un incremento en la conciencia de los beneficios de la lectura labio-facial y de una mejoría en la interacción con el acompañante significativo, sólo en el grupo con entrenamiento ($p < 0.05$). No se encontró diferencia grupal en la 'respuesta emocional'. Los IOI-AI y IOI-SO demostraron actitudes favorables hacia el programa. Las medidas de seguimiento mostraron una mejoría en la calidad de vida y la satisfacción en el grupo entrenado, mientras que en los controles se observó una disminución ($p < 0.05$). Algunos efectos fueron diferentes entre usuarios experimentados de auxiliares auditivos y aquellos usuarios de primera vez. La adición de servicios para amplificación y el involucramiento del acompañante significativo (SO) son relevantes en rehabilitación auditiva.

Hearing impairment negatively affects communication in daily life. Numerous investigations have demonstrated the impact of hearing impairment on performance of actions and tasks in daily living among elderly people (Kramer, 2005). Activity limitations (formerly 'disabilities') and participation restrictions (formerly 'handicaps') manifest themselves in a variety of ways. Also, the effects of hearing loss are not necessarily limited to the individual with the hearing loss. People with whom the affected individual interacts may well experience difficulties (Stephens et

al, 1995). New insights in audiological rehabilitation underline the role of the environment (e.g. the significant other) in audiological interventions (Héту et al, 1993; Jerger et al, 1995; Stephens, 1996; Noble, 1996; Borg, 2000; Borg et al, 2002; Heine et al, 2002; Kiessling et al, 2003; Preminger, 2003). This is also reflected in the latest model of the International Classification of Functioning, Disability, and Health (ICF) (WHO, 2001) in which disability is recognized as an interaction between features of the person and features of the overall context in which the

person lives. Consequently, hearing disability and handicap are no longer viewed as features of the individual but rather as outcomes of a complex interaction of the individual with contextual factors. In such an ecological approach, the role of the significant other (a person with whom an important and regular relationship is maintained) may be assumed to be just as relevant as the role of the affected individual for the enhancement of communication and improvement of performance and psychosocial wellbeing.

Despite increased recognition of the need to encompass the above sorts of social circumstances, audiological rehabilitation is predominantly restricted to hearing aid fitting only. Amplification does have positive effects on communication and certain aspects of psychosocial functioning among elderly people and their significant others (Arlinger, 2003; Joore et al, 2003; Brooks, 2001). However, the limited influence of hearing aids on the considerable difficulties elderly individuals experience in common activities and communication situations have been highlighted as well in the international literature (Stephens, 2003; Joore et al, 2003; Tesch-Römer, 1997). Moreover, it is shown that many older people do not continue to use hearing aids after fitting, and that many older people who do use hearing aids continue to report communication difficulties in everyday life (Hickson & Worrall, 2003; Hickson et al, 1999b).

While most rehabilitation programs ignore the relationship between hearing-impaired subjects and their significant others, some do not. Examples are the programs developed by Héту and Getty (1991) and Hickson et al (1996). A significant improvement in communication skills and certain aspects of psychosocial functioning was observed for those attending the group programs as opposed to controls who received no training (Hickson & Worrall, 2003). Getty and Héту (1991) found their subjects (industrial workers) to be more confident in dealing with their hearing problems after participation in the group sessions. Follow-up results showed that the hearing-impaired workers judged their problems as being significantly less severe. Further rehabilitative interventions designed for hearing aid candidates and users, such as training in speech reading, active listening training, and hearing tactics are reported by Abrams et al, 1992; Andersson et al, 1994; Norman et al, 1995; Kricos and Holmes, 1996; and Beynon et al, 1997. Positive effects on communication performance and reduction in self-perceived handicap were found. Evidently, the addition of rehabilitative services to hearing aid fitting in the rehabilitation process are relevant elements which need to be further explored and evaluated.

The intervention programs mentioned above, all have in common that they are based on weekly group meetings. While group meetings may be more beneficial than individual treatments for training of communication strategies, there are some considerable disadvantages. Particularly among elderly people, group meetings may constitute a barrier to participation due to logistic difficulties such as mobility problems, ill health or even lack of time. From the professional point of view, a disadvantage of group meetings is the need for resources. Accommodation and extra personnel with expertise are needed. Groups usually do not exceed about 10 participants, particularly when individuals with hearing loss are involved. Hence, a relatively small number of patients can be reached yearly. These disadvantages may well be

the reason for the limited application of such interventions in regular audiological care.

The present paper describes the development of a home education program for older adults with hearing impairment and their significant others. The program encompasses training of communication strategies, speech reading, information on how to use hearing aids and information on additional technical devices. Furthermore, a randomized clinical trial was conducted to evaluate the effectiveness of the home education program. The aim of the present study was to examine whether addition of the program to standard audiological care (i.e. hearing aid fitting) would be more beneficial in terms of enhancing communication and aspects of psychosocial wellbeing, than hearing aid fitting alone. Maintenance of the effectiveness at six months follow-up was investigated. Self-report scales were used as outcome measures. The hypothesis is that the home education program, added to standard hearing aid fitting, is significantly more effective for older adults with hearing loss and their significant others – in terms of increased knowledge, improved emotional response to hearing loss, enhanced communication and improved interaction with the significant other – than hearing aid fitting alone. Facilitators of the program as well as obstacles are discussed.

Methods

Home education program

The home education program is a self-administered intervention. It comprises 5 videotapes (the program is available on DVD as well) and an instruction booklet. Each videotape contains a short film representing a daily life situation. Performers in the films are amateurs. The leading actress in all films is a person with hearing loss. Each film shows a situation with which most elderly people are familiar. Difficulties that are frequently experienced in everyday living are addressed. Adequate and inadequate coping behaviors of both the person with the hearing impairment and the significant others are highlighted. Subsequent to the demonstration of the entire film, scenes are repeated and discussed (Figure 1), showing how communication strategies (or tactics) may positively change the situation. Examples of speech reading exercises are added, as well as a demonstration of how speech is perceived by an individual with average hearing loss, with and without hearing aids. The aim of the home education program is to raise problem awareness for both the affected individual and the significant other, to enhance communication and to provide knowledge about the nature and consequences of hearing loss.

The program is structured with increasing difficulty:

Film 1 – One-to-one conversation in a quiet room at home (13 min).

Film 2 – Birthday party in a noisy environment (11.5 min).

Film 3 – Conversation with a stranger, outside in the street (14.5 min).

Film 4 – Visit to a doctor in the hospital (11.5 min).

Film 5 – Group meeting with strangers (18 min).

The films use accumulation as a teaching tool, that is strategies shown in the previous films are repeated in the subsequent one. The instruction booklet contains five chapters,



Figure 1. Example of a fragment of the home education program.

each referring to a corresponding film. Communication strategies demonstrated in the film are categorized and summarized in each chapter and the entire script of the film is appended to each chapter. Also, questions and themes for discussion are included. While the program is primarily designed for older adults, it is applicable in younger age groups as well. Also, it can be used in individual counseling. The program is in Dutch. The example shown in Figure 1 has been translated into English.

Participants

Older adults who visited the audiological center for hearing aid fitting and who had given their consent, were randomly assigned to a training group (hearing aid fitting+home education program) or a control group (hearing aid fitting only). In total, 58 hearing-impaired clients (among whom 55 were accompanied by a significant other) started the project. One couple in the training group withdrew from the project due to serious health problems. Another couple in the training group had difficulties operating the video system and decided to stop. Eight hearing-impaired participants and seven significant others failed to return the post-intervention or follow-up questionnaires, even after a reminder was sent.

Finally, a total of 48 hearing-impaired older adults and 46 significant others completed the program and all questionnaires. The training group consisted of 24 hearing-impaired subjects and 24 significant others. The final control group comprised 24 hearing-impaired subjects and 22 significant others. The two groups of participants with hearing impairment were well

balanced: the groups did not differ in age, gender and hearing loss, neither did the two samples of significant others differ in both groups. Details of the groups are presented in Table 1.

Procedure

Videotapes (or DVD) were sent by regular mail to the participant's home, one at a time. The first tape was accompanied by the instruction booklet. Participants were instructed to return the tape within one or two weeks. As soon as the tape was returned the next one in the series was sent. The duration of the course ranged from 5 to 12 weeks. The mean duration was 11 weeks ($SD = 3.7$). The relatively long time-span allowed the participants to acquire new knowledge, to try new communication strategies, and to exercise.

Outcome measures

Various self-report outcome instruments were used to measure the effect of the intervention. All questionnaires were in paper-and-pencil format and were sent to the participants by regular mail. All questionnaires were in Dutch.

I. An open-ended questionnaire comprising nine questions (see Appendix 1) was administered to both the hearing-impaired elders and their significant others in the training group. One of the nine questions comprised a rating scale. Respondents were instructed to rate their overall satisfaction with the program on a scale ranging from 0 (no satisfaction) to 10 (extremely satisfied).

II. A set of eight questions was administered to the hearing-impaired participants in the training group and the control group at three different times: pre- and post-intervention, and

Table 1. Characteristics of the hearing impaired participants and their significant others (SO) in the training group and the control group. Hearing impaired participants in both groups did not differ significantly (N.S.) on any of the variables presented, neither did the SO's. (Educational levels of significant others were not available)

Variable	Hearing impaired			Significant others		
	Training group	Control group		Training group	Control group	
N	24	24		24	22	
Age, mean (sd)	69 (7.7)	71 (8.5)	N.S.	61 (10.6)	63 (11.9)	N.S.
Gender (male/female)	16/8	12/12	N.S.	4/20	5/17	N.S.
Educational level, mean (sd)	4.5 (2.1)	3.6 (1.8)	N.S.	—	—	N.S.
PTA (0.5,1,2,4 kHz) mean (sd)	53.7 (13.3)	56.3 (15.7)	N.S.			
Hearing Aid Use (first/experienced)	12/12	9/15	N.S.			

six months after the intervention (follow-up). Questions comprising the 'emotional response' scale (5 items) were derived from the Hearing Handicap and Disability Inventory (Van den Brink, 1995). They deal with acceptance of loss, interaction with others and lack of self-confidence. A few new items addressing communication strategies and speech reading were added. The set of 8 questions, shown in Appendix II, represent two scales: Emotional response: Questions 1, 2, 3, 4 and 5 (alpha coefficient = 0.79) Communication Strategies: Questions 6, 7 and 8 (alpha coefficient = 0.67). Answer categories were coded as 4 (yes!), 3 (yes), 2 (more or less), 1 (no), and 0 (no!), with lower numbers representing better outcomes. For each subject, mean scale scores were calculated. Those scores were used in the statistical analysis.

III. The section of the Hearing Handicap and Disability Inventory on 'reaction of others' (Van den Brink, 1995) was used as a scale of attitudes of significant others towards their hearing-impaired partner. The wording of items was adjusted so that the questions would be applicable to significant others. The scale comprised 10 questions (see Appendix III). Answer categories were 'almost never' (0), 'sometimes' (1), 'often' (2) and 'almost always' (3), with lower scores representing better outcomes. The scale was administered to the significant others prior to and after the intervention. For each subject the mean scale score was calculated.

IV. The Dutch version of the International Outcome Inventory (IOI) – a self report measure of change – was administered twice: once immediately after the intervention and six months later (follow-up). The IOI-HA is a short seven-item tool addressing use, benefit (BEN), residual activity limitation (RAL), satisfaction (SAT), residual participation restriction (RPR), impact on others (IOTH), and quality of life (QOL) (Cox et al, 2002; Cox & Alexander; 2002; Stephens, 2002; Kramer et al, 2002). Each item was scored from 1 to 5, a higher score being indicative of a better outcome. Four equivalent versions of the IOI were used. Although the subjects in the training group received both a hearing aid and the home education program, it was decided to administer only one version of the IOI to each participant. The IOI-HA (hearing aids) was administered to hearing-impaired participants in the control group, and the IOI-AI (alternative interventions) (Noble, 2002) was administered to the hearing-impaired participants in the training group. The IOI-HA and IOI-AI for the significant others (IOI-HA-SO and IOI-AI-SO) were administered to the significant others in the control and training groups respectively. IOI items were separately examined in the statistical analysis.

Pearson's correlation coefficients were calculated to examine the relationship between the outcome measures (emotional response scale, communications strategies scale, rating of overall satisfaction and the IOI). The emotional response scale correlated significantly with: IOI item 5 (residual participation restriction) ($R = -0.36$, $p < 0.05$); IOI item 6 (impact on others) ($R = -0.44$, $p < 0.01$); and with the overall rating of satisfaction ($R = -0.45$, $p < 0.05$). Furthermore, the rating of overall satisfaction correlated significantly with IOI item 2 (benefit) in the training group ($R = 0.62$, $p < 0.01$). Among the significant others (training group only) the overall rating of satisfaction with the program correlated significantly with: IOI item 1 (use) ($R = 0.50$, $p < 0.05$); IOI item 4 (satisfaction) ($R = 0.66$, $p < 0.01$); and IOI item 7 (quality of life) ($R = 0.53$, $p < 0.05$).

Statistics

First, the effect of demographic variables on the outcome measures was examined. The variables included age, gender, educational level (eight levels varying from 'elementary not completed' (1) to 'university' (8)), degree of hearing loss (average PTA at 0.5, 1, 2, and 4 kHz across both ears) and hearing aid use (first-time versus experienced hearing aid users). Experience of hearing aid use (first time (0) versus experienced users (1)) appeared to significantly influence some of the outcome measures. Hence, this variable was considered as an extra between-subjects factor in the subsequent analyses. To test the difference between the training group and the control group in the course of time (difference between pre, post, and follow-up measures), a General Linear Model (GLM) Repeated Measures was used for each of the outcome measures separately (univariate). GLM Repeated Measures provides analysis of variance when the same measurement is made several times on each subject. Group (training versus control) and experience of hearing aid use (first time versus experienced user) were specified as 'between-subjects' factors. Time (pre-intervention, post, and follow-up) was the 'within-subjects' factor. In addition, interactions of the 'between-subjects' factors with the 'within-subjects' factor were included. All statistical analyses were performed using SPSS 10.0

Results

Open-ended questionnaire

Results of the open-ended questionnaires demonstrated favorable comments reported by both the hearing-impaired elders and their significant others in the training group. The vast majority of the participants (90%) reported that they had learned from the program and were implementing the communication strategies in their daily life. The participants were able to recall a wide range of strategies that had helped them in their personal life. Among the most frequently reported remarks were: '*I am aware of and experiencing the benefits of speech reading*', '*I am now able to inform/admit to others that I have a hearing loss*', and '*Since we have done the course, there is more understanding and patience in our relationship*'. The most frequently reported critical comment concerned the appropriateness of the program for those with many years of experience with hearing loss. The rating of overall satisfaction with the program was 7.9 (± 1.1) and 7.7 (± 1.3) for the hearing-impaired participants and the significant others respectively.

Emotional response and communication strategies

The means and standard deviations of the pre-intervention, post-intervention, and follow-up scores on the emotional response scale and the communication strategies scale for both groups are given in Table 2. A significant group difference, in favor of the training group, was found. The significant effect (group \times time) was found on the mean scores of the communication strategies scale including item 6 (*Watching a person's face facilitates communication*), item 7 (*I am aware of the benefits of speech reading*) and item 8 (*Significant others take my hearing loss into account*). An improvement in communication strategies in the training group was observed after the treatment (post-intervention), while no improvement was observed in the control group ($p < 0.05$). The mean scores then remained stable up to and including follow-up. The result is graphically presented in

Table 2. Mean scores (and standard deviations; sd) on the emotional response scale and the communication strategies scale for each group. Lower scores represent better outcomes

	Mean score (sd)			Sign
	Pre	Post	Follow-up	
Factor 1 (emotional response)				N.S.
Training group	1.4 (0.6)	1.3 (0.6)	1.4 (0.6)	
Control group	1.8 (0.8)	1.6 (0.6)	1.8 (0.5)	
Factor 2 (communication strategies)				p < 0.05
Training group	1.8 (0.9)	1.5 (0.7)	1.5 (0.8)	
Control group	1.8 (0.8)	2.0 (0.8)	1.9 (0.8)	

Figure 2. No significant group difference was found for the emotional response scale (Figure 2). However, a significant three-way interaction effect (group \times time \times experience with hearing aids) was found on the mean scores of the emotional response scale ($p < 0.05$). (The three-way interaction was not found for the communication strategies scale). This interaction effect is illustrated in Figure 3. Items included in the emotional response scale are: item 1 (*My hearing loss makes me insecure*), item 2 (*I know how to deal with my hearing loss*), item 3 (*My hearing loss causes lack of self-confidence*), item 4 (*I find it difficult to accept my hearing loss*) and item 5 (*I find it difficult to ask other's help when I can't hear*). It means that the change over time for the emotional response was different for first time hearing aid users compared to experienced hearing aid users. In other words, the variable 'experience with hearing aids', moderated the difference between the two groups (training and control) in the course of time.

Attitudes of significant others

The adjusted section on 'reaction of others' of the Hearing Handicap and Disability Intervention appeared to be totally insensitive. A ceiling effect was observed. Mean scores on all items in the control and training group, both prior to and after the intervention, ranged from 0.10 (± 0.31) to 1.0 (± 1.1). The significant others assessed their own attitudes towards their hearing-impaired partners as optimal and most favorable, even before the intervention was started. It means that any improvement could not be measured with this outcome tool. No negative change in attitude was observed.

IOI

The IOI is a self-report measure of change. The mean post-intervention and follow-up scores for both the hearing-impaired and the significant others are presented in Figure 4. Means and standard deviations are given in Table 3. It is noted here again that the participants either received the IOI for hearing aids (IOI-HA) (controls) or the IOI for alternative interventions (IOI-AI) (training group). Both the hearing-impaired subjects and the SO's showed favorable attitudes towards the hearing aids (control group) and towards the home education program (training group). In the control group, mean scores ranged from 3.1 (± 1.2) to 4.3 (± 0.7) for the hearing-impaired subjects, and from 3.3 (± 1.2) to 4.6 (± 0.9) for the significant others. In the training group, mean scores ranged from 2.7 (± 0.9) to 4.4 (± 0.7) for the hearing-impaired individuals and from 2.6 (± 0.8) to 4.6 (± 0.6) for their significant others. In the training group (and partly in the control group) the significant others demonstrated more favorable attitudes on item 3 (*How much difficulty does partner still have?*), item 5 (*How much have partner's hearing difficulties affected the things you can do?*), and item 6 (*How much were you bothered by partner's hearing difficulties?*) compared with the attitudes of the hearing-impaired participants. However, these differences were not significant.

IOI scores over time

For the significant others, in both the control and the training group, the differences between post-intervention and follow-up scores were not significant, except for item 5 (*Over the past two weeks with his/her present hearing aids/using the communication*

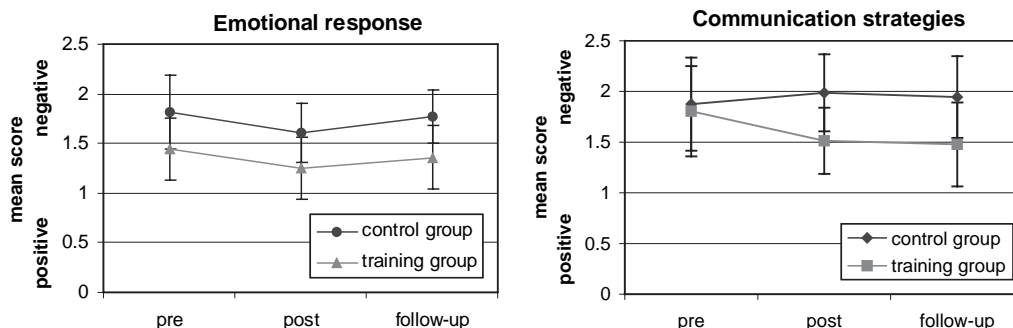


Figure 2. Means and standard deviations of the scores on the emotional responses scale (left panel) and communication strategies scale (right panel) for the control and training group at three different times: pre-intervention, post-intervention and at 6 months follow-up. A significant group difference (interaction group \times time) was found on the communication strategies scale, in favor of the training group (right panel) ($p < 0.05$).

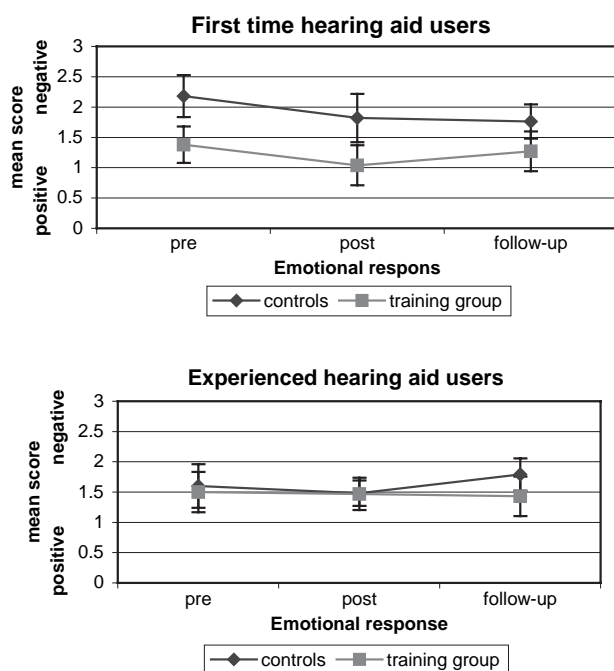


Figure 3. Mean scores on the emotional response scale of the first users (upper panel) and experienced hearing aid users (lower panel) at three different times: pre-intervention, post-intervention and at 6 months follow-up. The figures show a significant difference between the two subgroups in the change of the mean score over 6 months ($p < 0.05$).

strategies, how much have your partner's hearing difficulties affected the things you can do?). A significant decline was observed, but this occurred both in the control group and in the training group ($p < 0.05$), so a group difference was not found.

Among the hearing-impaired participants, a significant group effect (control versus training) in the difference between post-intervention and follow-up scores was found for item 7 (*Considering everything, how much has your present hearing aid(s)/the*

home education program changed your enjoyment of life?). The effect ($p < 0.05$) is shown in Figure 5. While a relapse was found in the control group at 6 months follow-up, an improvement in enjoyment of life was experienced in the training group. This effect occurred in both the first time and experienced hearing aid users.

A comparable group \times time interaction effect was found on the mean scores of item 4 (*Considering everything, do you think you present hearing aid(s)/the home education program is worth the trouble?*). This group \times time interaction effect was moderated by the 'experience with hearing aids' factor (group \times time \times experience interaction, $p < 0.05$). In the subgroup of first-time hearing aid users, a significant increase in the satisfaction with the home education program was found, while the satisfaction with hearing aids (controls) decreased over 6 months ($p < 0.05$). The effect is shown in Figure 6. For the experienced hearing aid users, this effect was not observed (See Figure 6, lower panel).

Discussion

The present paper describes the development of a home education program for hearing-impaired older adults and their significant others. It is a self-administered treatment. Little resources and effort are needed to implement the program in a regular audiological clinic. All participants returned the videotapes within the time agreed upon. The fact that individuals are allowed to follow the program in their own environment facilitates the program. Those who are reluctant to participate in group meetings are now able to learn about important issues in a structured way at home and are not reliant on written material only. Another facilitator of the program is that it can be used in group meetings and in individual counseling as well. One obstacle is that people need to have a video (or DVD) system at home and need to know how to operate it. One couple in the present study withdrew from the program because using the system was too difficult for them. However, the vast majority were successful in operating it. One couple preferred to use the DVD version of the program.

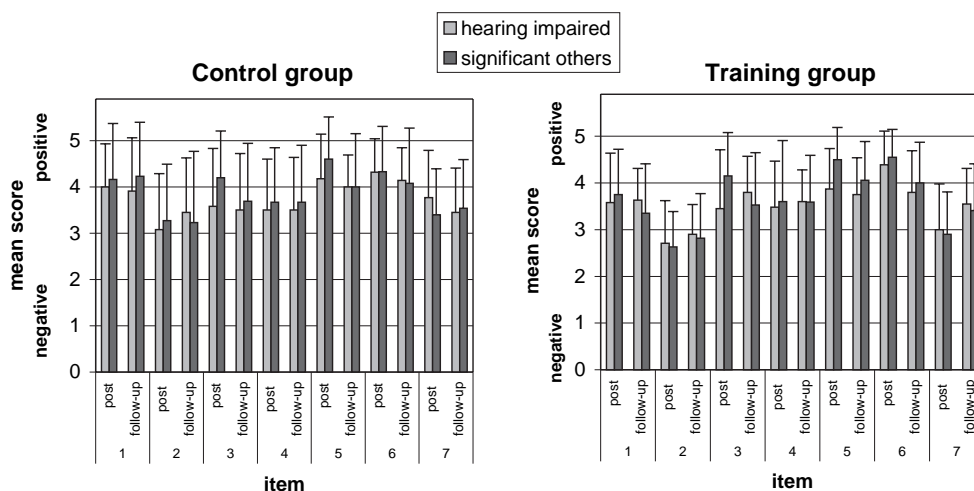


Figure 4. Mean post-intervention and follow-up scores of hearing impaired participants and their significant others on the items of IOI-HA (control group) and IOI-AI (training group).

Table 3. Means and standard deviations of the scores of the hearing impaired participants (HI) on IOI-HA and IOI-AI (upper panel) and the significant others (SO) on the IOI-SO and IOI-AI-SO (lower panel). Higher scores represent better outcomes. It is indicated whether the difference between the groups (control vs training) in the change over time (post – follow-up) was significant or not (N.S.)

	Control group (IOI-HA)		Training group (IOI-AI)		Sign
	Post	Follow-up	Post	Follow-up	
HI					
IOI 1	4.0 (0.9)	3.9 (1.2)	3.6 (1.1)	3.6 (0.7)	N.S.
IOI 2	3.1 (1.2)	3.5 (1.2)	2.7 (0.9)	2.9 (0.6)	N.S.
IOI 3	3.6 (1.3)	3.5 (1.2)	3.5 (1.3)	3.8 (0.8)	N.S.
IOI 4	3.5 (1.1)	3.5 (1.1)	3.5 (1.0)	3.6 (0.7)	<0.05
IOI 5	4.2 (0.1)	4.0 (0.7)	3.9 (0.9)	3.8 (0.8)	N.S.
IOI 6	4.3 (0.7)	4.1 (0.7)	4.4 (0.7)	3.8 (0.9)	N.S.
IOI 7	3.8 (1.0)	3.5 (1.0)	3.0 (1.0)	3.6 (0.8)	<0.05
	Control group (IOI-SO)		Training group (IOI-AI-SO)		Sign
	Post	Follow-up	Post	Follow-up	
SO					
IOI 1	4.2 (1.2)	4.0 (1.4)	3.8 (1.0)	3.3 (1.0)	N.S.
IOI 2	3.3 (1.2)	3.1 (1.6)	2.6 (0.8)	2.9 (0.9)	N.S.
IOI 3	4.2 (1.0)	3.6 (1.3)	4.2 (0.9)	3.5 (1.1)	N.S.
IOI 4	3.7 (1.2)	3.5 (1.4)	3.5 (1.0)	3.6 (0.7)	N.S.
IOI 5	4.6 (0.9)	4.0 (1.1)	4.5 (0.7)	4.1 (0.8)	N.S.
IOI 6	4.3 (1.0)	4.1 (1.1)	4.6 (0.6)	3.9 (0.9)	N.S.
IOI 7	3.4 (1.0)	3.4 (1.1)	2.9 (0.9)	3.4 (1.0)	N.S.

Open ended questionnaire

Responses to the open-ended questionnaire demonstrated benefit of the training program for both the hearing-impaired individuals and their significant others. 90% of the subjects reported using the strategies in their personal situations (Question 3). Answers to the questions on trying out new communication strategies and on what had changed since participation in the home program (Q4–Q6) indicated typical results. Comments such as ‘*Enjoyment of time together is much better*’, ‘*There is a stronger motivation to solve problems*’, ‘*Increased understanding of the problems*’ and ‘*I am now able to admit my hearing loss to others*’ represent essential elements in the process of accepting the hearing loss and in learning how to cope with it. These may contribute to a better psychosocial functioning. High ratings of both the hearing-impaired subjects and their SO’s show that both groups were highly satisfied with the program.

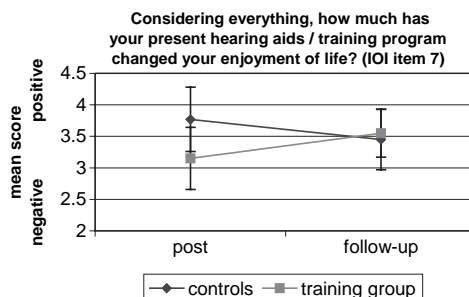


Figure 5. Mean post-intervention and follow-up scores on IOI 7 of hearing impaired participants in the control and training group. The figure shows a significant difference between the two groups ($p < 0.05$) in the change of the mean score over 6 months.

The most frequently reported negative comment (Q9) concerned the limited appropriateness of the program to those with a long history of hearing loss. Those participants had acquired the strategies by the method of trial and error during the process of integrating the loss into their lives. Despite this, confirmation of appropriate behavior shown in the videos made them more confident in dealing with their hearing loss. The comment of one person ‘*I should have done this course when I got my first hearing aids, years ago*’ illustrates the importance of education at the beginning of the rehabilitation process. It highlights the specific needs of different populations and is an indication as to who will benefit most from the intervention. Regarding the open-ended results, it must be noted that response bias may have occurred. Participants invested time and energy in watching the videos, so they may have felt the tendency to respond positively.

Emotional response and communication strategies

A significant group difference was found for the communication strategies scale (Figure 2, right panel). A change in a positive direction was found in the training group, while this was not observed among the controls. It indicates an increased awareness of the benefits of speech reading and an improved interaction with the significant other, among those who received the training program in addition to hearing aid fitting, as opposed to those who received hearing aid fitting only. No difference between the training and control group was found for the emotional response scale (Figure 2, left panel). It indicates that the home education program does not have an extra effect beyond hearing aid fitting on the emotional response. Also, it may indicate that the emotional process takes longer than 6 months and that benefit from the program will only appear after a longer period of time. Integrating hearing loss into one’s life may take years (Herth, 1998).

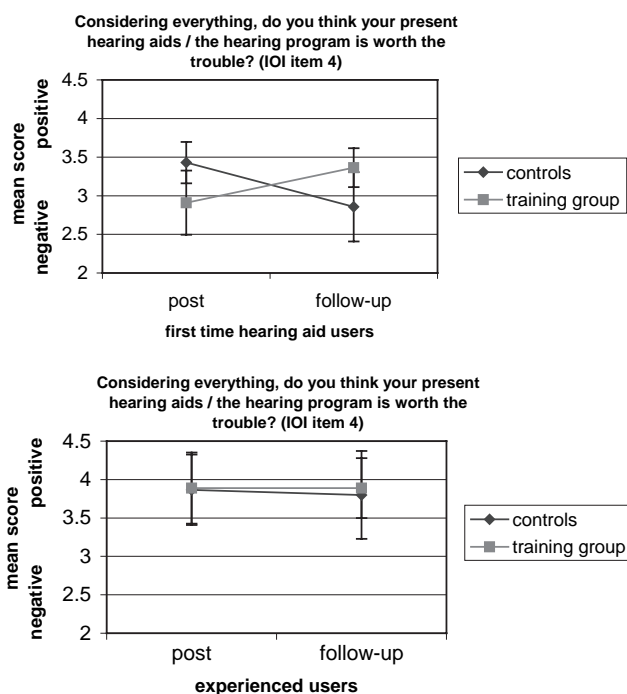


Figure 6. Mean post-intervention and follow-up scores on IOI item 4 (SAT) of first time hearing aid users in the control and training group. The figures show a significant difference between the two subgroups in the change of the mean score over 6 months ($p < 0.05$). Only among first time hearing aid users a significant interaction with group (control vs training) was observed ($p < 0.05$).

Nevertheless, the results of this study are in agreement with the results of Kricos and Holmes (1996) who examined the efficacy of an active listening program; and Andersson et al (1994) and Beynon et al (1997) who evaluated a behavioural counseling program (i.e. teaching hearing tactics) and a communication course. Kricos and Holmes (1996) found an improvement in functioning as measured by the Communication Profile for the Hearing Impaired (CPHI, verbal and non-verbal strategies), but failed to detect a significant group difference (control vs. treatment) using the Hearing Handicap Inventory for the Elderly (HHIE). The latter focuses on emotional issues related to hearing loss. Kricos and Holmes (1996) argue that the CPHI is a more sensitive measure of the effects of communication training than the HHIE. Andersson et al. (1994) found an improvement in several areas of activity (e.g. shopping, parties, or conversations) among those who were taught hearing tactics compared to controls who were not, but failed to find an effect in general emotional functioning measured by the Life Orientation Test (LOT). Similarly, Beynon et al (1997) found a reduction in handicap for the 'communication' and 'vocational' subscales of the Quantified Denver Scale of Communication Function (QDS); but did not find an extra effect of their rehabilitation program which included speech reading, tactics, and hearing aid use, on the 'self' (i.e. emotional response) and 'family' scales when comparing the scores with the results of the control group (hearing aid fitting only). Regarding the findings in the present study and the results of the studies mentioned above, it may well be that hearing aid fitting per se positively influences emotional

functioning, while extra rehabilitation programs are needed to get the hearing-impaired individual more involved in daily life interactions and to enhance communication. Another option is that the home education program may have an effect on the emotional response when it is applied earlier in the rehabilitation process, even before hearing aid fitting. Support for this option was provided by one subject in our study who was a candidate for hearing aids, but refused to purchase them. After having participated in the home education program he was persuaded to purchase and use the hearing aids. Effectiveness of the program prior to hearing aid fitting needs to be further investigated.

It must be noted that comparison between the self-administered home education program and treatments based on group meetings (as described above) should be made with care. Group meetings may have different or even greater impact on psychosocial well-being than self-administered treatments, such as the home education program.

Significant others

Unfortunately, the scale used to measure the effectiveness of the program in terms of changed attitudes among SO's appeared to be insensitive due to a ceiling effect. Prior to the intervention, highly positive and favorable attitudes of significant others towards their hearing-impaired partners were reported. The SO's either were reluctant to admit their maladaptive behavior or they just didn't recognize themselves in the attitudes described in the items of the scale. According to their reports, nothing had to be improved. Despite this finding, the SO's judged the home education program as highly relevant and necessary in the rehabilitation of their hearing-impaired partners/friends and for themselves as assessed with the open-ended questionnaire. The effect of the program among SO's is further explored with the IOI-AI-SO as discussed in the next paragraph.

IOI

Outcomes obtained with the IOI-HA, IOI-AI, IOI-HA-SO, and IOI-AI-SO showed favorable attitudes of both the hearing-impaired participants and their significant others towards the hearing aids and towards the home education program. While statistically insignificant, it is interesting to note that SO's (particularly in the training group) had higher scores on IOI item 3 (residual activity limitation), item 5 (residual participation restriction), and item 6 (impact on others) compared to their hearing-impaired partners. Those items comprise IOI-HA factor 2 (Cox & Alexander, 2002; Stephens, 2002; Kramer et al, 2002), reflecting the influence of the intervention on the interaction with the outside world (i.e. SO).

A group effect was observed on the maintenance of the positive attitudes over 6 months among the hearing-impaired participants. While the experienced enjoyment of life (item 7) improved in the training group, it got worse in the control group. This is an interesting result. It is encouraging to notice that the home education program has a positive long-term effect on quality of life. A similar finding was observed for satisfaction (item 4) among first time hearing aid users. Both item 4 and item 7 are part of IOI-HA factor 1 (Cox & Alexander, 2002; Stephens, 2002; and Kramer et al, 2002). The findings suggest that some effects may only appear after a longer period of time, depending on the type of intervention. This emphasizes the necessity to include

long-term evaluations in treatment effectiveness research. It is not only that short-term effects may disappear, but also that unforeseen long-term effects may arise. Knowledge about such changes may yield relevant information for the development and application of intervention programs in audiological rehabilitation and in treatment effectiveness research.

The variable 'experience with hearing aids' appeared to have a significant influence throughout the analyses. Apparently, effects of interventions may differ for first time and experienced hearing aid users. This is a relevant issue in treatment effectiveness research that should be considered in future investigations.

Finally, despite limitations of the present study and despite the requirement for further research, this study yields substantial and relevant information as to what the additional effects of home education are and to whom it is most beneficial. The present work adds to the evidence that interventions additional to hearing aid fitting have significant extra effects on issues relevant in audiological rehabilitation, compared to hearing aid fitting alone.

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Appendix I: Open-ended questions

1. How many times did you view each tape?
2. How much time did you spend for each film?
3. Have you shown the films to others (except SO)?
4. Have you learned from the program? If yes, what did you learn?
5. Have you tried out new strategies since you have taken the home course?
6. Which of the communication strategies changed your daily life situation for the better?
7. Has your contact with the significant other changed for the better since you have taken the home course? If yes, in what respect?
8. Please rate your overall satisfaction with the program on a scale ranging from 0 (no satisfaction) to 10 (extremely satisfied).
9. Reviewing the program, what is your most important critical comment?

Appendix II: Hearing Handicap and Disability Inventory

Emotional response

1. My hearing loss makes me feel insecure.
2. I know how to deal with my hearing loss.
3. My hearing loss causes a lack of self-confidence.
4. I find it difficult to accept my hearing loss.
5. I find it difficult to ask for others' help when I can't hear.

Communication strategies

6. Watching a person's face facilitates communication.
7. I am aware of the benefits of speech reading.
8. Significant others take my hearing loss into account

Appendix III: Attitudes of Significant Others

1. I think it is bothersome when the person with hearing impairment asks me to repeat what I have said.
2. I leave the hearing-impaired person out of the conversation when he/she can't understand what is being said.
3. I get annoyed when the hearing-impaired person does not understand what is being said.
4. I think that the person with hearing loss only hears what he/she wants to hear.
5. I avoid starting conversations with my hearing-impaired partner.
6. I talk in a way that enables my hearing-impaired partner/friend to understand me.
7. I have the patience to repeat every word if necessary.
8. I try to help the hearing-impaired person when he/she can't understand what's being said.
9. I understand what it means to be hearing impaired.
10. I take the hearing loss of my partner/friend into account.

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