Satisfaction with telemedicine for teaching listening and spoken language to children with hearing loss

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Summary

Auditory-Verbal Therapy (AVT) is an effective early intervention for children with hearing loss. The Hear and Say Centre in Brisbane offers AVT sessions to families soon after diagnosis, and about 20% of the families in Queensland participate via PC-based videoconferencing (Skype). Parent and therapist satisfaction with the telemedicine sessions was examined by questionnaire. All families had been enrolled in the telemedicine AVT programme for at least six months. Their average distance from the Hear and Say Centre was 600 km. Questionnaires were completed by 13 of the 17 parents and all five therapists. Parents and therapists generally expressed high satisfaction in the majority of the sections of the questionnaire, e.g. most rated the audio and video quality as good or excellent. All parents felt comfortable or as comfortable as face-to-face when discussing matters with the therapist online, and were satisfied or as satisfied as face-to-face with their level and their child's level of interaction/rapport with the therapist. All therapists were satisfied or very satisfied with the telemedicine AVT programme. The results demonstrate the potential of telemedicine service delivery for teaching listening and spoken language to children with hearing loss in rural and remote areas of Australia.

Introduction

Auditory-Verbal Therapy (AVT) is an effective early intervention for children with hearing loss. It is a parent-based treatment that promotes early diagnosis, one-to-one therapy with active parental participation, aggressive audiological management and modern hearing technology (e.g. hearing aids and cochlear implants). The approach guides parents to develop their children's spoken language through listening. The goal of AVT is to allow children with hearing loss to reach their full potential in the hearing world.[1]

Recent studies have demonstrated the value of AVT in promoting listening and spoken language. Dornan and colleagues[2–4] compared the development of a group of 19 children with hearing loss in an AVT programme over a 50-month period, with children with normal hearing. Non-significant differences in speech, language and self-esteem were reported over the study period between the two groups, as well as similar reading and mathematical skills.[2–4] These findings are in keeping with other reports of speech and language development with AVT.[5–7] It has been suggested that AVT, in combination with early diagnosis of the hearing loss and appropriate aiding, helps to stimulate auditory brain development. This allows children to make meaning of what they hear and lays down the neural pathways for the normal development of speech and language.[8,9]

Hear and Say is an AVT and paediatric cochlear implant centre in Queensland. AVT sessions are offered to families soon after diagnosis through to school entry. Families typically enter the programme once their newborn babies have been identified with a hearing loss via newborn screening. The conventional face-to-face AVT service (i.e. where the parent, child and Auditory-Verbal Therapist are located in the same room) is currently provided to 189 children and families in Brisbane and the four regional centres across Queensland. In addition, the Outreach AVT telemedicine programme (Outreach AVT) currently supports 41children and families living in rural and remote areas of Queensland, where the time and cost of travel for these families represent barriers to accessing the conventional service.

Outreach AVT programme

The Outreach AVT programme involves: (1) the remote delivery of AVT sessions via PC-based videoconferencing every two weeks between the therapist in Brisbane and the parent/guardian and child at home; (2) planning sessions on the alternate week over videoconferencing between the

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therapist and parent; (3) the provision of themed 'lesson boxes' on monthly rotation to families, with materials to support the sessions and carryover of tasks; (4) two visits a year by the therapist to the child's home and educational setting where applicable for face-to-face contact, some lessons, assessment of speech and language ability using standardized assessments and monitoring of progress; and (5) at least two family trips per year to the Hear and Say Centre in Brisbane for face-to-face contact, some lessons, assessment of progress and attendance at playgroup and parent education sessions.

The Outreach AVT sessions take place using Skype 5.5 for Windows on PCs using high-speed broadband access. In circumstances where families are unable to fund the necessary equipment such as laptops and web cameras, Hear and Say provides it. The Outreach AVT sessions are conducted in accordance with the ten principles of AVT and in line with face-to-face management (see Appendix 1, online only supplementary data: http://jtt.rsmjournals.com/lookup/suppl/doi:10.1258/jtt.2012.111208/-/DC1). The sessions are one hour long and involve the parent teaching the child specific concepts through listening, under the guidance of the therapist. Lessons incorporate goals in the areas of listening, early communication, language, speech, cognition, social interaction (communicative competence), fine and gross motor skills. The goals are planned every six months for each individual child and these are typically based on developmental milestones expected for children with normal hearing of the same age. The AVT sessions incorporate a number of goals from each category and include activities from the themed lesson boxes. The planning sessions on the alternate weeks allow the therapists and parents to plan and discuss the next session's goals and carryover into the child's everyday environment.

The aim of the present study was to investigate parent and therapist satisfaction with the service.

Methods

Permission to undertake the study was obtained from the appropriate committee. All 17 families accessing the Outreach AVT programme at the time were invited to complete a Parent Satisfaction Questionnaire during their annual visit to the Hear and Say Centre in Brisbane. All families had been enrolled in the Outreach AVT programme for at least six months. Their average distance from the Hear and Say Centre was 600 km (SD 372). The children's ages at the time of the study ranged from 6 months to 6.5 years, with an average age of 3.1 years (SD 1.9). The parent who was predominantly involved in the Outreach AVT sessions was invited to complete the questionnaire. The five therapists based in Brisbane who were involved in the Outreach AVT programme were also invited to complete a Therapist Satisfaction Questionnaire. Participation in the study was voluntary and the questionnaires were anonymous.

Satisfaction questionnaires

The Parent and Therapist Questionnaires evaluated the level of satisfaction with: (1) the audio and video quality during videoconferencing; (2) equipment use (e.g. Skype, web camera, speakers, desktop microphone); (3) general parent-therapist interaction and communication during videoconferencing; (4) service delivery and convenience; and (5) overall satisfaction with the Outreach AVT programme. Questions on the 19-item Parent and 17-item Therapist questionnaires were rated using a four-point scale (see Appendixes 2 and 3 respectively, online only supplementary data: http://jtt.rsmjournals.com/lookup/suppl/doi:10.1258/jtt.2012.111208/-/DC1). Parents and therapists were also invited to provide additional comments relating to each section where appropriate.

Results

Thirteen of the 17 families and all five therapists completed the questionnaires. On the Parent Satisfaction Questionnaire, 61% of responders rated the audio quality as excellent or good, 58% rated the video quality as excellent or good, and 61% found that they often or always experienced technical difficulties that required troubleshooting during the sessions (Table 1). When using the equipment, 61% of parents were initially comfortable or very comfortable, and this increased to 100% after six months, when all parents found the equipment easy or very easy to use. All parents reported being comfortable or as comfortable as face-to-face when participating in the Outreach AVT sessions and 91% also rated their child's level as comfortable or as comfortable as face-to-face. All parents felt as comfortable as face-to-face when discussing matters with the therapist online, and were satisfied or as satisfied as face-to-face with their level and their child's level of interaction/rapport with the therapist. Parents were confident or very confident (92% of ratings) that the therapist gained an adequate understanding of their child's development and progress via the Outreach AVT sessions, and 89% felt that the Outreach AVT sessions were often or always a better alternative than travelling regularly to receive face-to-face sessions. Finally, all parents rated the lesson quality and delivery as often or always consistent from week to week, were satisfied or very satisfied overall with the Outreach AVT programme and would definitely recommend the service to someone else in a similar situation to themselves.

On the Therapist Satisfaction Questionnaire, 60% of responders rated the audio quality as good, 80% rated the video quality as good or excellent, and 80% rarely experienced technical difficulties requiring troubleshooting during the sessions (Table 2). All therapists were comfortable or very comfortable using the equipment initially as well as after six months, and rated the equipment as very easy to use. All therapists were also comfortable or as comfortable as face-to-face when participating in the Outreach AVT sessions and when

Table 1 Responses to the Parent Satisfaction Questionnaire

Question	No of responses	Response			
Audio and video quality					
What is your opinion of the sound quality?	13	Poor 0%	Fair 39%	Good 46%	Excellent 15%
What is your opinion of the video quality?	12	Poor 8%	Fair 33%	Good 33%	Excellent 25%
How often do you experience technical difficulties that require troubleshooting during the sessions?	13	Never 0%	Rarely 38%	Often 23%	Always 38%
Equipment use					
How comfortable were you when you first started using the equipment?	13	Very uncomfortable 0%	Uncomfortable 39%	Comfortable 46%	Very comfortable 15%
How comfortable are you now when using the equipment?	11	Very uncomfortable 0%	Uncomfortable 0%	Comfortable 55%	Very comfortable 45%
How easy to use is the equipment (Skype, web camera, microphone)?	13	Very difficult to use 0%	Difficult to use 0%	Easy to use 62%	Very easy to use 38%
General interaction and communication					
How comfortable are you when participating in the Outreach AVT sessions?	12	Very uncomfortable 0%	Uncomfortable 0%	Comfortable 67%	As comfortable as face-to-face 33%
How comfortable is your child when participating in the Outreach AVT sessions?	11	Very uncomfortable 0%	Uncomfortable 9%	Comfortable 73%	As comfortable as face-to-face 18%
How comfortable are you when discussing matters with your therapist online?	10	Very uncomfortable 0%	Uncomfortable 0%	Comfortable 40%	As comfortable as face-to-face 60%
How satisfied are you with your level of interaction/rapport with the online therapist?	13	Very dissatisfied 0%	Dissatisfied 0%	Satisfied 62%	As satisfied as face-to-face 38%
How satisfied are you with your child's level of interaction/rapport with the online therapist?	12	Very dissatisfied 0%	Dissatisfied 0%	Satisfied 67%	As satisfied as face-to-face 33%
How confident are you that your therapist is gaining an adequate understanding of your child's development and progress via the Outreach AVT sessions?	12	Very unsure 0%	Unsure 8%	Confident 50%	Very confident 42%
Service delivery, access and convenience					
Do you feel that the quality and delivery of the online lessons are consistent from week to week?	9	Never 0%	Rarely 0%	Often 22%	Always 78%
Are the Outreach AVT sessions a better alternative than travelling regularly (e.g. weekly or every 2 weeks) to receive face-to-face AVT sessions?	9	Never 11%	Rarely 0%	Often 22%	Always 67%
Overall satisfaction					
How satisfied are you overall with the Outreach AVT programme?	12	Very dissatisfied 0%	Dissatisfied 0%	Satisfied 25%	Very satisfied 75%
Would you recommend this service to someone else in a similar situation to yourself?	13	Definitely not 0%	Probably not 0%	Probably 0%	Definitely 100%

Table 2 Responses to the Auditory-Verbal Therapist Satisfaction Questionnaire

Question	No of responses	Responses			
Audio and video quality					
What is your opinion of the sound quality?	5	Poor 0%	Fair 40%	Good 60%	Excellent 0%
What is your opinion of the video quality?	5	Poor 0%	Fair 20%	Good 60%	Excellent 20%
How often do you experience technical difficulties that require troubleshooting during the sessions?	5	Never 0%	Rarely 80%	Often 20%	Always 0%
Equipment use					
How comfortable were you when you first started using the equipment?	5	Very uncomfortable 0%	Uncomfortable 0%	Comfortable 60%	Very comfortable 40%
How comfortable are you now when using the equipment?	5	Very uncomfortable 0%	Uncomfortable 0%	Comfortable 20%	Very comfortable 80%
How easy to use is the equipment (Skype, web camera, microphone)?	5	Very difficult to use 0%	Difficult to use 0%	Easy to use 0%	Very easy to use 100%
General interaction and communication					
How comfortable are you when participating in the Outreach AVT sessions?	5	Very uncomfortable 0%	Uncomfortable 0%	Comfortable 60%	As comfortable as face-to-face 40%
How comfortable are you when discussing matters with your families online?	5	Very uncomfortable 0%	Uncomfortable 0%	Comfortable 20%	As comfortable as face-to-face 80%
How satisfied are you with the level of interaction/rapport you have with your families online?	5	Very dissatisfied 0%	Dissatisfied 0%	Satisfied 40%	As satisfied as face-to-face 60%
How satisfied are you with the level of interaction/rapport you have with your children online?	5	Very dissatisfied 0%	Dissatisfied 40%	Satisfied 40%	As satisfied as face-to-face 20%
How confident are you that you are gaining an adequate understanding of the development and progress of your children via the Outreach AVT sessions?	5	Very unsure 0%	Unsure 20%	Confident 60%	Very confident 20%
Service delivery, access and convenience					
Do you feel that the quality and delivery of your online lessons are consistent from week to week?	5	Never 0%	Rarely 0%	Often 60%	Always 40%
Ideally, how often do you feel that your families would benefit from face-to-face AVT sessions?	5	Weekly 0%	Every 2 weeks 20%	Monthly 60%	Quarterly 20%
Overall satisfaction					
How satisfied are you overall with the Outreach AVT programme?	5	Very dissatisfied 0%	Dissatisfied 0%	Satisfied 40%	Very satisfied 60%

discussing matters with families online. All therapists were satisfied or as satisfied as face-to-face with their level of interaction/rapport with families online, while only 60% were satisfied or as satisfied as face-to-face with their level of interaction/rapport with the children online. The therapists reported being confident or very confident (80% of ratings) that they gained an adequate understanding of the development and progress of their children online, and all felt that the quality and delivery of the online lessons were often or always consistent from week to week. The therapists felt that ideally, families would benefit from monthly or quarterly face-to-face AVT sessions (80% of ratings). Overall, all therapists were satisfied or very satisfied with the Outreach AVT programme.

Discussion

Audio and video quality

The audio quality during videoconferencing was rated as excellent, good or fair by the parents. There were difficulties with the Internet connection causing audio delays, echo/static and audio fading in and out during sessions, which contributed to the fair ratings (39%). Under the guidance of the therapists, parents solved these problems in various ways, including disconnecting and reconnecting the videoconference and pausing for longer before replying to allow the therapist to finish talking. Troubleshooting was necessary for the majority of families on a regular basis during each session.

The therapists provided similar ratings of the audio quality to the parents and reported the same problems with the Internet connection. The therapists commented that although the audio quality was adequate for general conversation during the sessions, it was often more difficult to judge the finer aspects of the child's speech production via videoconferencing, particularly /s/ and /sh/ word endings. Although the therapists were able to compensate for this by clarifying the child's speech production with the parent, this audio problem was noted as a drawback when compared to face-to-face management. Difficulties judging speech production via videoconferencing have also been noted in other online speech pathology studies and were managed by recording the sessions for later review.[10,11] Despite this problem for the therapists, the audio quality overall was not considered a barrier to the successful delivery of Outreach AVT, as the programme relies on guiding the parents to teach their child listening and spoken language. Therefore, by more heavily involving parents in the clarification of their child's speech production during the sessions, there is the potential for greater carryover of strategies into the child's everyday environment.

In relation to the video quality during videoconferencing, greater variability in ratings was observed for both parents and therapists (Tables 1 and 2). In general, parents and therapists found the Internet connection to affect the video quality, creating image pixelation and delays on a regular basis during each session. Such difficulties have been reported to compromise user satisfaction in other telemedicine studies.[12,13] In the present study, the therapists proposed that in situations where the video quality made it more difficult to model the desired behaviour to parents, pre-recorded examples of strategies and activities could be made available to families prior to sessions. This may help to reduce any potential impact of the video quality and also increase user satisfaction.

Equipment use

When parents first enrolled in the Outreach AVT programme with their children, only a small proportion of them (15%) were very comfortable in using the equipment (Skype, web camera, speakers and microphone). The remainder were either comfortable or uncomfortable. After six months in the Outreach AVT programme, the level of confidence with the equipment use had increased substantially (Table 1). For the therapists, their level of comfort with the equipment was already high at the commencement of their outreach caseloads. Comfort levels continued to increase during the first six months of the programme, and all therapists found the equipment very easy to use (Table 2). Overall, the high parent and therapist comfort and ease with using the technology suggests that the delivery of the Outreach AVT programme lends itself to using off-the-shelf equipment, which is an important factor in promoting the cost-effectiveness and sustainability of the programme.

General interaction and communication

In relation to general interaction and communication, most parents and therapists were comfortable participating in the sessions via videoconferencing (67% of the parents and 60% of the therapists), and the remainder were as comfortable as they would be if the sessions were face-to-face. This is very encouraging. The majority of parents also felt that their children were comfortable (73%) when interacting with the therapist via videoconferencing and a further 18% rated their comfort to be the same as face-to-face. There was one parent who felt that their child was uncomfortable with the online modality, which the parent related to the child's young age. All parents showed a high level of satisfaction with their child's level of interaction/rapport with the therapist via videoconferencing (33% as satisfied as face-to-face; 67% satisfied). It was the therapists who showed greater variability in ratings (20% as satisfied as face-to-face; 40% satisfied; 40% dissatisfied) and reported difficulties in engaging directly with the younger children. Such problems have been identified in other speech pathology telemedicine studies, where it has been suggested that the telemedicine services may be more appropriate for children older than 6 years.[14] Despite these difficulties, the therapists in the present study did not consider the age of

the child to have a negative effect on AVT delivery online. The high satisfaction with the level of interaction/rapport between parents and therapists further supports the use of telemedicine for AVT delivery.

When discussing matters online, the majority of parents and therapists were also as comfortable as face-to-face, which is very encouraging. Overall, parents felt that the therapists were able to gain an adequate understanding of their child's development and progress online. Such levels were similarly reflected in the therapist ratings. The therapists noted a heavier reliance on parent reports to ascertain the child's development and progress, which again helps to promote greater parental involvement and carryover.

Service delivery and convenience

Parents felt that the session quality and delivery was consistent from week to week (78% always; 22% often), while the therapists noted the Internet connection difficulties to affect the sessions, which was reflected in the lower ratings (40% always; 60% often consistent). With the exception of one parent who would always prefer face-to-face sessions, parents in general felt that the Outreach AVT sessions were a better alternative than travelling regularly to Brisbane and related this to the inconvenience of travelling long distances with young children and the cost of regular travel. The therapists were also positive about the Outreach service, although they felt that for new families and those requiring greater AVT or behaviour management support, a higher number of face-to-face sessions should be incorporated into the programme. Further investigation is needed in this area.

Overall satisfaction

Parents were very satisfied or satisfied with the Outreach AVT programme overall, which is encouraging and important for programme sustainability. All parents stated that they would recommend this type of service to someone else in a similar situation to them. Further comments from parents regarding the Outreach AVT programme included:

> *Without these sessions being available to us, we would be very concerned about our daughter's ability to attend a mainstream school next year. As a temporary solution to our needs in an isolated part of the world, as far as early intervention goes, it is fantastic.*
>
> *You get the chance to discuss the little but important things that would be dealt with in regular face-to-face sessions. This all goes towards you feeling and being supported and in control of your child getting complete support.*
>
> *We hope to improve our Skype quality and gain greater benefit from our AVT sessions. This problem is at our end, not the fault of the Centre – just a dilemma of living in an isolated rural area.*

The therapists were also very satisfied or satisfied with the Outreach AVT programme overall. Their comments included:

> *It provides a good service where families currently have no other option. I think it is ideal for AV coaching to parents.*

In conclusion, the high parent and therapist satisfaction with the Outreach AVT programme overall emphasizes the potential of this type of service delivery for teaching listening and spoken language to children with hearing loss in rural and remote areas of Australia.

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