The ‘acceptability’ of Skype mediated Speech and Language Therapy provision to school aged language impaired children

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Declaration

I, Rebecca Alison Matthews, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signed:

Date: 8th June 2014

Abstract

There is high demand for Speech and Language Therapy but even with initiatives to address the shortage of therapists, Speech and Language Therapy services struggle to satisfy demand - tele-technology could be a solution. A Speech and Language Therapy service for a paediatric caseload using a desktop video-conferencing system (Skype) was established. A pilot study with three participants determined the feasibility of the Skype Speech and Language Therapy service and trialled measures of clinical activity, therapist-child interaction, technological utility, and costs. Eleven participants aged between 7 and 14 years with varying therapy needs took part in the main study. Each received a mix of face-to-face (F2F) and Skype Speech and Language Therapy over the ten session trial period. Data were collected for every session using a session profile; adults supporting the children were asked for their views using a questionnaire at the beginning and end of the trial; the child participants were interviewed after the trial period was over; one F2F and one Skype session was video recorded for each participant; work activity was recorded along with identifiable costs of the F2F and Skype Speech and Language Therapy sessions

The level of clinical activity was equivalent between F2F and Skype Speech and Language Therapy sessions, with parents reporting positive views concerning Skype intervention, and growing acceptance of Skype interaction. The analysis of the therapist-child interaction showed broadly similar patterns between the Skype and F2F sessions, with the exception on the use of requests, clarifications, acknowledgements and confirmations where differences were observed. Technological utility was acceptable with minimal audio and visual distortions. Costs for Skype Speech and Language Therapy were substantially lower than the F2F sessions. This research showed that, for the families participating in this research, Speech and Language Therapy services delivered using tele-technology can provide an acceptable alternative to F2F intervention.

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Chapter 1 Introduction

Tele-technology is wide-ranging, both in its form and level of technological sophistication. It has been used in a large number of different settings – business, education, military, health and purely for social benefit. There has been investment to develop user friendly, low-cost tele-technology systems that have increased the use of tele-technology worldwide. The increase in computer and internet use is set to increase in the United Kingdom (UK) as the Government remains committed to establishing internet connection for every household in the UK along with access to a computer and the internet with its 'Race Online 2012' initiative (http://raceonline2012.org).

Demand for a wide range of health services across the world is increasing and despite the development of easy to use affordable tele-technology systems that could potentially enable greater access to health services, there has been sporadic and patchy development of health services using tele-technology (Miller 2011). Speech and Language Therapy, like other health professions, faces increased demand with fewer professionals to deliver its services; it is also under pressure to provide support that its evidence led management is both effective and acceptable. It is possible that tele-technology has the potential to provide part of the solution to this service delivery issue. However, its use in the UK to provide Speech and Language Therapy remains limited to a few sporadic services funded for a limited time period (Katsavarus, 2001, McCullough, 2001, Howell, Triptoli and Pring, 2007, Styles, 2008). Research from the American Speech and Hearing Association (ASHA) in 2002 identified a number of barriers to providing Speech and Language Therapy services through tele-technology and that their membership did not consider tele-technology an acceptable way to provide Speech and Language Therapy (ASHA, 2002).

1.1 Acceptability for Speech and Language Therapy service using Skype

The concept of acceptability was chosen as the criterion on which to evaluate a Speech and Language Therapy service using Skype. Acceptability will vary with perspective – as a user or provider or purchaser of a service. Even within these three groups - users,

providers and purchasers - there is likely to be a wide range of standards that define the acceptability of a specific service. The word acceptability suggests the notion of a minimum standard for a service to function being both usable and effective. So in essence any tele-technology health service needs to replicate face-to-face (F2F) provision to be considered acceptable (Lemaire et al, 2001; Ward et al, 2007).

There are a number of features for any service to address to make its service usable. For a service that uses tele-technology the most obvious are access, usability and costs involved; but it should also include factors that are changed by using the technology – the ethical and legal issues, along with clinical success and adaptation of protocols around behaviour and provider-patient communication (Miller, 2011). To address the changes in these factors requires not only training but also a change in work practice (Miller, 2011).

In those Speech and Language Therapy services that have evaluated 'client satisfaction' there has been positive acceptance for a service provided remotely using technology from the participant's perspective (Katsavarus, 2001, Sicotte, Lehoux, Fortier-Blanc and Leblanc, 2003, Ward, Crombie, Trickey, Hill, Theodoros and Russell, 2007, Styles, 2008, Theodoros, Hill, Russell, Ward and Wootton, 2008, Tindall, Huebner, Stemple and Kleinert, 2008, Carey, O'Brian, Onslow, Block, Jones and Packman, 2010, Grogan-Johnson, Alvares, Rowan and Creaghead, 2010, Constantinescu, Theodoros, Russell, Ward, Wilson and Wootton, 2010, Hein Ciccia, Whitford, Krum and McNeal, 2011). Despite evidence of client acceptance, an ASHA survey (ASHA, 2002) highlighted reluctance to use tele-technology to provide Speech and Language Therapy services by the therapists i.e. the provider perspective. There were four areas that emerged from the ASHA's research where therapist concerns underpinned this reluctance - professional, clinical, tele-technology and cost.

1.2 Research Question

The main question, for the study reported here, has been to determine if Speech and Language Therapy sessions provided through a low-cost desktop video-conferencing system could be considered as acceptable as F2F Speech and Language Therapy

sessions. Four aspects were evaluated – clinical activity i.e. goals achieved in the two session formats, the reliability of the tele-technology, comparison of the interaction between the therapist and child in both session formats and the costs to provide Speech and Language Therapy through video-conferencing and F2F.

Data were collected in a session profile for all the trial sessions; a pre and post trial questionnaire was used to collect the views of the adults – on the clinical activity, usability of the tele-technology, and interaction and also an individual interview with the child participants that asked for their views on the clinical activity, tele-technology and interaction; a video recording of one F2F and one Skype session for each participant was made as well as recording the time taken for all work activity during the trial period.

The data from these different sources were used to determine whether the clinical goals achieved in the Skype sessions were equivalent to the F2F sessions, determine the disruption from the Skype technology in the Skype sessions, identify differences in the interaction of the therapist and child in the two session formats and compare the cost of providing the F2F and Skype Speech and Language Therapy sessions.

1.3 Research Design

This research set up a Speech and Language Therapy service using the desktop video-conferencing system, Skype, enabling clients to receive intervention in their home or school rather than a central clinic base. This Speech and Language Therapy service combined Skype and F2F session formats so that clients had a mixed combination of session formats that was agreed with them. This mixed combination of session formats was offered to children aged 6 years and older inline with ASHA professional guidelines (ASHA, 2005), from the research therapist's existing caseload and new referrals in the following year. No specific medical diagnosis was used to include or exclude participants although children with only a phonological or articulation difficulty were not invited to participate.

The research used the principle of triangulation, repeated measures and within subject measures to collect data to address the research question – Speech and Language Therapy provided using Skype can be acceptable to the therapists. The adults supporting the child participants were asked for their views in a questionnaire as the trial of sessions began; they were asked to complete a second questionnaire using the same questions as the trial sessions ended to ensure that there was no bias in their initial view to this novel approach to providing Speech and Language Therapy; the child participants were interviewed after the research trial sessions were completed using the same questions as had been used in the questionnaire for the adult participants; a F2F and Skype session was video recorded for each participant to make a direct comparison of the therapist and child interaction in the two session formats; a session profile was used to record specific data for each participant's session; this included a record of clinical activity completed and session goals achieved, number of interruptions, rating of the audio and visual acuity, participation of the child and work activity time used to provide that specific session.

A pilot study with three secondary school aged children had two functions: firstly to refine the selection criteria, administration and materials used in the Skype sessions and secondly, to trial the data collection protocols.

1.4 Research Method

In the main study eleven children aged 7-13 years took part. Ten sessions for each participant, a combination of the F2F and Skype session formats were evaluated; the parents and one education professional completed a questionnaire as Skype sessions began and for a second time when the trial of ten sessions were complete; ten of the eleven children were interviewed, whilst the mother of the youngest child was interviewed in his place; for all eleven participants a F2F and Skype session was recorded which was transcribed before being coded using the discourse coding scheme developed by Pennington and McConachie (1999). The therapist recorded work activity timing to establish the costs to provide each of the trial sessions.

1.5 Research Results

The results showed that more activity was achieved in the Skype sessions than the F2F Speech and Language Therapy sessions and this was supported by the analysis of the interaction as fewer turns were required to complete the same activity in the Skype session; both adults and one of the participants commented that it was 'harder work' in the Skype session and this was borne out by those activities which when used in the Skype Speech and Language Therapy session required a greater number of requests from the child than in the F2F session.

The adults viewed the quality of the technology more positively in the second questionnaire and this shift in view was statistically significant; the equal number of turns between the main speakers and the fewer requests for clarification in the Skype session supported the research finding that any breaks in the connection were minimal and not a disruption.

Analysis of the interaction showed much the same pattern of turns and moves in the two session formats for each speaker; some differences in the use of the two request utterances for the therapist and child participant were observed; there were fewer speaker interruptions in the Skype session which supported the observations from experimental research (Anderson et al, 1996, O'Malley et al, 1996) that the speakers could judge the other speaker as effectively as when in conversation F2F.

The calculation of cost per minute to provide Skype Speech and Language Therapy sessions was substantially less than the equivalent F2F sessions.

1.6 Conclusion

In the ten years since ASHA (2002) identified a range of therapist concerns to using tele-technology to provide Speech and Language Therapy services, much has changed to overcome these concerns. ASHA developed professional guidelines which were published in 2005; there has been a steady stream of Speech and Language Therapy services publishing their research to inform on the feasibility of using tele-technology

to provide Speech and Language Therapy assessment and specific formatted therapy programmes to various communication impaired client groups; the advances in the technology software design have reduced the concerns on the quality and manageability of the technology; this in turn has limited the negative impact on clinical activity and the patient-therapist working relationship; the technology has not only improved in design and quality but also its affordability reducing costs.

The combination of these factors make the use of tele-technology increasingly more acceptable, not just to the patients but the therapists, and consequently a potentially viable solution to the pressures on the profession to provide services to more patients with reduced resources.

Chapter 2 Literature Review

This chapter will clarify the terminology and discuss the specific issues affecting service delivery of Speech and Language Therapy in the UK currently. It will provide an overview of how Speech and Language Therapy Services in the UK and abroad have used tele-technology to date to deliver their services and critically review the research methods used to evaluate these services. It will identify the barriers to using tele-technology to provide Speech and Language Therapy and define the definition of acceptability for this research.

2.1 Current issues delivering Speech and Language Therapy services in the UK

Speech and Language Therapy, compared to other health professions, is relatively new. The now Royal College of Speech and Language Therapists (RCSLT) was established in the early part of the twentieth century. Interest and activity in speech and language issues at the time was focused on stammering and the brain injured with little interest in developmental issues. In the past sixty years Speech and Language Therapy has broadened its focus to include all age groups; an ever increasing range of speech, language or communication difficulties including swallowing and feeding difficulties; a wide variety of locations for service delivery including the individual's home, educational settings - nursery, independent and state primary and secondary schools; and has extended services to nursing and residential homes, hospital wards and outpatient clinics, health centres, GP surgeries, Adult Day Centres and even HM Prisons.

2.1.1 Size of the Profession

Speech and Language Therapy is a small profession with just 13,064 Speech and Language Therapists registered with the Health Professions Council (HPC) in the UK compared to 44,926 Physiotherapists, 31,998 Occupational Therapists and 26,544 Radiographers (HPC, 2011). The majority of Speech and Language Therapists are employed by the NHS but increasingly employment opportunities beyond the NHS are

advertised in the RCSLT professional magazine 'Bulletin' that include private healthcare organisations, local education authorities, specialist schools, charitable organisations and independent practice.

2.1.2 Size of Service Demand

The demand for Speech and Language Therapy has grown as the knowledge base and range of clinical interests in the profession has expanded. It is estimated that at any given time there are 2.5 million individuals in the UK with some form of speech, language, communication and swallowing difficulty (NHS Careers, 2005). Divided evenly between the number of practising Speech and Language Therapists, regardless of experience or employer, this would give each therapist a caseload of 200 clients. Analysis of new referrals to NHS Speech and Language Therapy services shows a steady increase in numbers referred – 346,000 new referrals to Speech and Language Therapy services in the NHS in 2004 representing an annual increase of 1% – and are evenly divided between adults and children (Department of Health, 2005). This calculated increase of 1% may not be completely accurate, as it does not account for individuals choosing to access an alternate Speech and Language Therapy service that is not NHS based. The recent Bercow Review (2008) estimated that 7% of children entering school had some form of speech, language and communication difficulty. The national charity ICAN in 2006 produced a report which suggested that 40,000 children without Speech and Language Therapy would grow up more likely than other groups to be jobless, socially excluded and involved in criminal activity (Hartshorne, 2006). Estimated demand for Speech and Language Therapy by an older population has increased over the years and was estimated to use 19% of Speech and Language Therapy work time in 2002 (Rossiter, 2002).

2.1.3 Service Delivery Solution

The increasing demand for Speech and Language Therapy may be a consequence of new initiatives that have expanded Speech and Language Therapy services – Surestart early intervention centres, regional brain injury units, services specific to cancer and cochlear implant services as well as specialist stroke teams (Department of Health,

2002); pressure to provide services to a wider range of clinical groups, including those with dementia, mental health, adults with learning difficulties and linguistic minorities (Department of Health, 2002); heightened awareness of Speech and Language Therapy - who it can support and the services it can offer; changes to service delivery as a result of government philosophy i.e. inclusion in mainstream schools for children with special educational needs as well as health service reforms and consequent changes in management structures (Clarke, McConachie, Price and Wood, 2001).

With an increasing breadth of services to provide and increasing demand for these services, an increasing amount of ingenuity is required to meet the demand especially when there are identified inequalities for clients to access the most appropriate Speech and Language Therapy service for their needs (Wilson, Lincoln and Onslow, 2002). This has led to a gradual shift in the work activity of Speech and Language Therapists with reduced emphasis on directly working with clients and increased emphasis on training, planning and preparing programmes of intervention for others to follow along with report writing and other administration activities (Dobson and Worral, 2001). There remain for many, within and outside the profession, concern and limited evidence that working indirectly is as effective as working directly with clients (Dobson and Worral, 2001; Baxendale and Hesketh, 2003). Even when Speech and Language Therapy services provided indirectly have been shown to achieve their goals (Boyle, McCartney, O'Hare and Forbes, 2009), it remains unclear what is needed to ensure success without the direct F2F intervention of the qualified therapist.

2.1.4 Personnel Retention

Pressure on Speech and Language Therapy services not only comes from the increased demand for Speech and Language Therapy but also the increasing amount of legislation, other government work initiatives and changes within the management of the NHS. A series of surveys carried out over the last two decades have identified a number of reasons for the poor retention both of experienced Speech and Language Therapists and at some points of less experienced therapists, which has affected the ability of the NHS to consistently and reliably provide the diverse range of Speech and Language Therapy services uniformly across the United Kingdom (Rossiter, 2000).

With a drop in the number of posts vacant, Speech and Language Therapy Service Managers identified service stability linked to an increase in numbers of newly qualified therapists, favourable job regrading after the Equal Pay for Equal Work legal battle ended (Wynn Davies, 1997, Gadhok and McClennon, 2004) and shortage profession status which allowed easier recruitment of qualified foreign nationals to locum positions. However this has been followed in more recent years with staff redundancies and frozen posts coupled with downgrading of many Speech and Language Therapy posts with the implementation of the Agenda for Change initiative (Rossiter, 2006). Without therapists the profession will be unable to meet the demand for Speech and Language Therapy services. Service delivery solutions need to be not only cost efficient but also time efficient with a reduced work force.

Tele-technology has been proposed as a solution (Edelman and Hall, 1998) to resolve the demand for Speech and Language Therapy services in the UK. Speech and Language Therapy is not alone in facing the challenges to meet demand with not enough staff. Other health professions including doctors, physiotherapists, and nurses, face the same challenge (Whitten, Johannessen, Soerensen, Gammon and Mackert, 2007) and with over a thousand published medical services worldwide using some form of tele-technology (Demiris and Tao, 2005; Roine, Ohinmaa and Hailey, 2001), there is plentiful experience for Speech and Language Therapy services to draw upon to make tele-technology a workable solution.

2.2 Tele-technology

Telecommunication technology, shortened to tele-technology, can include a wide range of communication technologies. These can include very familiar equipment such as the telephone – landline or mobile – whether used for verbal or for written communication i.e. fax or text as well as more recent technological developments such as the internet, email and videoconferencing. There is a wide range of systems to select from - videoconferencing systems can range from fixed units and dedicated Integrated Service Digital Network (ISDN) lines to a desktop computer with a single phone line connection.

2.2.1 Tele-medicine

Telemedicine is defined as the provision of any health service that is delivered remotely by a medically qualified health practitioner using telecommunications technology (American Speech Hearing Association [ASHA] 2005). Tele-health is the equivalent term for any health service delivered remotely by a health practitioner who is not medically qualified. Other terms used can be more specific such as 'tele-therapy' where the health service provided is delivered by a qualified therapist such as an occupational therapist so indicating the type of health service provided. Other tele-services are more general - not specifying the type of health worker providing the service but instead conveying an indication of the type of service being offered; tele-care is an example where a service is provided to a patient in, usually, a home setting by many different health professionals, ranging from a doctor, nurse to therapist or generic care worker. With wide ranging service terminology, it is important to clarify the type and form of health service that is provided using telecommunication technology.

2.2.2 Service Activity using Tele-technology

A vast array of tele-technology is already used in the provision of health care and so most health services could consider themselves to be 'tele-health' services. However the concept of a 'tele' service is not the incidental use of the technology but its use specifically to provide a service or an aspect of service. Service activity can be assigned to one of three aspects in any health service provision. These aspects are firstly liaison i.e. discussion between therapist and other professionals, secondly assessment and thirdly the core service activity itself i.e. therapy (ASHA, 2005).

2.2.3 Descriptive Terminology

For some aspects of a service, the activity provided through tele-technology does not necessarily have to happen with both parties at the same time. Various administrative

activities can be carried out through email, text or fax without the need for the receiver to be present as the activity is carried out; this is referred to as 'store-and-forward' activity (ASHA, 2005) and is asynchronous.

Activity that involves both participants in the communication exchange at the same time is described as real time (RT) or synchronous. It is possible to provide real time aspects of service without sight of the client e.g. a telephone call. Unlike other forms of tele-technology, videoconferencing enables each participant to see the other; out of all the various forms of tele-technology it best mirrors the traditional F2F situation (Whitaker, 1995). Videoconferencing services are often referred to as 'remote' and 'online' if provided through internet facilities.

Table 1 lists the different forms of tele-technology available alongside service characteristics i.e. F2F, FT or SAF and service activity identified by ASHA (2005) i.e. liaison, assessment and core activity. The table illustrates that video-conferencing (VC) and video-conferencing using an internet provider (VOIP) are both able to provide all three service activities typically provided F2F i.e. liaison, assessment and core activity. They differ on one feature only – the VOIP service enables both ends of the video link to store information that can be shared on the screen or sent electronically to the remote end.

Tele-tech System	Service Characteristics			Health Service Activity		
	F2F	RT	SAF	Liaison	Assessment	Core Activity
Telephone	No	Yes	Yes	✓		✓
Mobile	Possible	Yes	Yes	✓		✓
Fax	No	Yes	Yes	✓		
Email	No	Yes	Yes	✓		
VC	No	Yes	No	✓	✓	✓
VOIP	No	Yes	Yes	✓	✓	✓

Key:
VC = Video-conferencing using a dedicated camera, television system and 2+ ISDN lines
VOIP = Video-conferencing Over Internet Provider
F2F = Face-to-Face (in this instance refers to the client also seeing Speech and Language Therapy remotely)
RT = Real Time
SAF = Store and Forward

Table 1: Characteristics and service activity using Tele-technology Systems

2.3 The Experience of Other Health Professions using Tele-technology

A systematic review of tele-medicine services reported that there had been enthusiastic use of the technology to provide health services without rigorous evidence of efficacy (Jennett, Affleck-Hall, Hailey, Ohinmaa, Anderson, Thomas, Young, Lorenzetti and Scott, 2003). Foremost amongst the medical professions reported to use tele-technology were psychiatry and radiology; the former used the technology for real time consultations whilst the latter focused on store and forward (SAF) activity such as liaison and information sharing (Roine, Ohinmaa and Hailey, 2001).

The search for articles did not focus on a specific medical service but rather papers that had collated the experience of medical services using tele-technology; the search terms used were 'telemedicine' along with 'benefits' and 'drawbacks'.

2.3.1 Identified Benefits

The systematic review on the use of tele-medicine carried out by Whitten et al (Whitten, Johannessen, Soerensen, Gammon and Mackert, 2007), observed that the majority of medical services using tele-technology were based in North America and that a wide range of tele-technology systems were used. Six identified measurable benefits to telemedicine that indirectly contribute to client centred gains are 1) improved access to information; 2) provision of care not previously available; 3) improved access to services; 4) improved professional education; 5) quality control for screening procedures and 6) potential reduction in health care costs (Hjelm, 2005; Taylor, 1998). In addition there is potentially greater flexibility for patients to choose the health professional that they feel is best able to support them along with greater convenience and less stress in managing appointment times (Miller, 2011). However, whilst many services have shown the feasibility of the various systems used, there is no definitive evidence reported yet to demonstrate the same achievable clinical benefits and outcomes as F2F medical intervention (Currell, Urquhart, Wainwright, Lewis, 2000).

2.3.2 Identified Drawbacks

A plentiful list of drawbacks (Hailey, Roine and Ohinmaa, 2002) to tele-medicine has been identified not only for the client but also the health practitioner and service organisation. Apart from uncertainty about clinical benefits and a lack of established protocols (Miller, 2011), upheaval and uncertainty accompany changing clinical work practice; finance and management systems are needed to sustain and support change; services may fail through the incorrect purchase of tele-technology systems (Miller, 2011, Yellowlees, 2005), and may not be marketed successfully to users and providers (McMahon, 2005).

2.3.3 Addressing the Drawbacks

Yellowlees (2005) as well as Yu and Hilton (2005) concluded that there are a number of principles that need to be followed to facilitate successful implementation of tele-technology. It is important that services selected to use tele-technology are motivated to use the systems and can identify benefits to them or the client. Health practitioners must have ownership of the system and the support and management of the systems must be of the highest quality. The technology must be easy to use and yet meet the requirements to deliver the service; training to use and manage the technology as well as alter work practice is required. Evaluation is necessary to promote standards and information should be shared to widen the interest in this way of working.

For many, this set of principles would seem to be obvious and not specific to tele-technology services. It reflects what can be identified as good principles of management when setting up and maintaining any new working practice or initiative (Dillon, Loermans, Davis and Xu, 2005). Using these principles can make a substantial difference between acceptability and success or non-acceptability and failure (Dillon et al, 2005). These principles are reflected in the Speech and Language Therapy services that have, over the last three decades, pioneered the use of tele-technology to provide Speech and Language Therapy.

2.4 Tele-technology use to provide Speech and Language Therapy

With no obvious resource of collated information on the use of tele-technology to provide Speech and Language Therapy services, it was necessary to locate published information; first, to establish an overview of Speech and Language Therapy services provided through tele-technology, second, to collate their observations and third, to appraise their research methodology to inform this research project and its design.

2.4.1 Locating the Literature

The library search in 2007 focused on finding what research had been carried out to date on Speech and Language Therapy services using tele-technology and specifically using videoconferencing to provide Speech and Language Therapy. Using the library facilities at University College London the search used three search terms 'speech and language', 'therapy or pathology' and 'using videoconferencing'; nine databases were accessed that included JSTOR, AMED, ERIC, Medline, Ingenta Connect, PsychINFO, Web of Science, NHS Specialist library and Google Scholar; this search listed over 14,000 papers predominantly through the Google Scholar database but with 276 from the NHS Specialist Library, three from the Web of Science database and none from the other databases. Working through these papers, it became clear that the majority of papers were inappropriate because they referred to Speech and Language Therapy in general and the use of video rather than videoconferencing. Only the three papers listed from the Web of Science database were relevant to the search question 'Speech and Language Therapy provided through video-conferencing'.

A second search was carried out with the same search terms but using Boolean abbreviations such as (speech or language) and (therap? or pathology?) and (videoconf?); the second search used additional terms that included (teletherap? or teleconf?). The second search excluded the Google Scholar database. The same 276 papers from the NHS Specialist Library were listed, 15 in the Web of Science database and none from the remaining databases. The 276 papers from the NHS Specialist Library were discounted for the same reason as in the first search and from the 15 papers listed by the Web of Science database, 11 were considered relevant as they

were about Speech and Language Therapy provided through a videoconferencing link; these 11 papers included the three listed in the first search. One of the papers retrieved in the second literature search was a review of tele-technology used to provide Speech and Language Therapy (Hill and Theodoros, 2002); this review listed 13 studies where tele-technology had been used to provide Speech and Language Therapy service. At this stage a core of 20 studies had been identified.

The papers listed in the second search were located in three peer reviewed journals – 'Aphasiology', the 'American Journal of Speech-Language Pathology' and the 'Journal of Telemedicine and Telecare'; the first two journals are closely associated with Speech & Language Therapists/Pathologists whilst the latter is aimed at a wider range of health professions. In conjunction with a monthly alert using Metalib, these three journals were searched every three months for newly published articles; the journals included in this search widened to include the International 'Journal of Language and Communication Disorders' and the 'Journal of speech Language and Hearing Research'. As well as a formal search of the literature using the University library facilities, regular internet searches using Google were made to locate Speech and Language Therapy services using tele-technology and a request was placed in the RCSLT 'Bulletin' magazine to make contact with therapists using tele-technology in the UK. Two single service projects responded but did not have any research findings to share; one Canadian based commercial system, 'Tiny Eye', was located, trialled and a review written (Matthews, 2008). Following a personal conversation with one UK therapist, (Montgomery, 2008) an unpublished masters thesis was identified that had researched a UK based project using tele-technology (Katsavarus, 2001). Finally the websites for the North American Speech & Language Therapy/Pathology professional bodies – American Speech Hearing Association (ASHA) and the Canadian Speech language Pathology Association (CASLPA) - along with the Australian equivalent, were searched to identify information and guidance on using tele-technology to provide Speech and Language Therapy.

2.4.1.1 Establishing Criteria for Inclusion in this Literature Review

The criteria for including research papers were simple; those services that had no research findings to report and only described the service that they had established were excluded. Five criteria were used to evaluate those research papers that were not solely descriptive; these included first, a clearly identified research question, second, a description of the participants, third, data collection process that could be replicated, fourth, data analysis and finally, a plan to disseminate the research.

As the number of studies with published research findings increased, more rigorous criteria were used. Reynolds, Vick and Haak (2009) reviewed published research studies of Speech and Language Therapy services using tele-technology and used the Scottish Intercollegiate Guideline Network ([SIGN], www.sign.ac.uk/guidelines/fulltext/50/index.html); this same process was used to evaluate the additional researched papers as they emerged.

There were two stages to the evaluation process – in the first, each paper was categorised with a number depending on the type of research carried out; those that were systematic reviews or randomised controlled trials were given a grade of one; those that were case control or cohort studies were graded with a two; non analytic studies such as case reports were graded as three and those that were an expert opinion or conference report graded as a four; those studies that fell into the last group had already been excluded so that the research studies used for this literature review fell to grade one, two or three. The second part of the evaluation process reviewed the papers graded with one or two to rate the quality of their research against criteria specified in the SIGN guidelines; the criteria were specific for each research methodology and are set out in Appendix 1. A study with most i.e. 80% of the criteria fulfilled or described was given the top rating of '++'; where some but not all the criteria were fulfilled or described i.e. 50% or more a rating of '+' was given and those studies where few criteria were fulfilled were rated with '-'; a research paper with a minus was considered to lack robust conclusions. The rating given to each paper is set out in Table 2 on page 37.

2.4.2 Overview of Tele-technology used to provide Speech and Language Therapy

Over twenty Speech and Language Therapy services around the world have reported to have set up a Speech and Language Therapy service using tele-technology but not presented any research for publication in a peer reviewed journal. These were excluded from this review of Speech and Language Therapy provided through tele-technology. Table 2 sets out the 41 research papers from Speech and Language Therapy services using tele-technology. The papers are listed chronologically and assigned a number that is then used in this review to refer to that individual paper.

The table includes specific details of location, patient group served, and service activity provided as well as the form of tele-technology used along with the SIGN quality rating. The research outcomes have been focused mainly on feasibility i.e. can a specific aspect of Speech and Language Therapy service be successfully provided, but this has shifted over time to include acceptability i.e. whether clients would be content to access Speech and Language Therapy using the technology; in the course of the research other observations on the reliability of the technology and cost implications have been raised but have not been the prime focus of the research project; these observations along with acceptability and feasibility are specified in the final column of the table.

Only five services before 2000 used tele-technology but in the last decade this has changed dramatically with 36 services publishing research findings. The majority of Speech and Language Therapy services using tele-technology are in North America (21) and Australia (13) where the large distances that therapists would have to travel reduce their available clinical time. The majority of the tele-technology Speech and Language Therapy services serve adults with acquired communication difficulties: 30 focused only on adults whilst 11 provided a service solely for children.

2.4.2.1 Range of tele-technology used

The first service to report on providing Speech and Language Therapy using tele-technology was based in America back in 1976; prepared educational materials were sent to the clients prior to a telephone call consultation with the Speech and Language Therapist (Vaughn, 1976). There continue to be Speech and Language Therapy services similar to the Vaughn Study (1976) combining telephone calls with a postal service to share written, audio or video information (5, 18, 35 in Table 2). This service model relies on preparation as well as a reliable postal system to ensure a smooth and efficient service. More recently services have combined telephone calls with email (29, 35). The telephone consultation, whilst in 'real time', is clearly influenced by the quality of preparation – both by the therapist and the client – and with no visual contact the posted materials can limit the focus and consequently the success of the consultation. All the therapy services since 1976, that have used telephone technology as the means to deliver their service have provided a service for both adults and children with fluency disorders.

As tele-technology systems using video as well as audio have been developed, so too have Speech and Language Therapy services using both audio and video tele-technology – 36 in this literature review. There have been a number of variations in audio and video links which have included closed circuit television using computer controlled video through a telephone link (2 and 3), videoconferencing using satellite connections (4) and more recently simple videophones (32).

The most common tele-technology used by Speech and Language Therapy services to date has been dedicated videoconferencing units using bandwidths ranging from 1 to 3 ISDN line equivalents; these have been based in health establishments with appropriate engineer/technical support close by (6,7 9, 10, 11, 13, 15, 20, 22, 23, 25, 27, 30, 31, 33, 34). One Speech and Language Therapy service (8) has used a videoconferencing system with an internet connection and another (17) has developed its own specific system. As the number of computer to computer video and audio link services have increased, Speech and Language Therapy services have taken advantage of the increased flexibility, improved audio and video quality and affordability that

comes with desktop computers using a video link through an internet provider (11, 12, 14, 17, 19, 21, 24, 26, 36, 37, 41).

With such an increasingly wide variety of tele-technology combinations and levels of technical specification that have become available to provide a Speech and Language Therapy service, it is easy for a 'tele-technical novice' to be confused about what system would work best for their patients and their work setting. That such a wide variety of systems have been used indicates that the technology can potentially be matched to suit the specific circumstances of patients and therapists, their locality and the remit of the Speech and Language Therapy service. The reducing cost of computers and peripheral equipment such as headphones and web cameras combined with the increased quality in the performance, have made desktop video-conferencing technology both affordable and accessible to a wider population.

2.4.2.2 Range of client groups and service activity

Whilst the first Speech and Language Therapy services using tele-technology were focused on providing a service for adults, services have expanded to include children, some as young as five years of age. However just eleven of the 41 services included in this review have provided a service for children (5, 8, 9, 10, 13, 18, 24, 29, 33, 36, 40). An additional two have provided a service for adults that has also been extended to include children (17 and 21). The smaller number of paediatric Speech and Language Therapy tele-technology services may reflect the greater number of issues that need to be considered if using tele-technology to provide a service for children - not least how the tele-technology will be operated and supported at the child's end of the technology link (ASHA, 2005).

	Author/s and Date	Quality Rating	Location	System Used	Age Group	Clinical Need	Type of Service	Research Focus
1	Vaughn 1976	3	North America	Telephone	Adult	Dysphasia	Treatment Real Time Remote	Feasibility Acceptability
2	Wertz 1987	3	North America	VC system closed circuit TV	Adult Age not specified 36 participants	Dysphasia	Assessment Real Time F2F and Remote	Feasibility Reliability
3	Wertz 1992	3	North America	VC system closed circuit TV	Adult Age not specified 72 participants	Dysphasia	Assessment Real Time F2F and Remote	Feasibility
4	Duffy, Werven and Aronson 1997	2-	North America	Satellite video connection	Adult Age not specified 8 participants	Dysphasia	Assessment Real Time F2F and Remote	Feasibility Reliability
5	Harrison, Wilson and Onslow 1999	3	Australia and Europe	Telephone	Paediatric 5:10 years one participant	Dysfluency	Treatment Real Time Remote	Feasibility
6	Kully 2000	3	North America	VC system	Adult 38 years one participant	Dysfluency	Treatment Real Time Remote	Feasibility Acceptability
7	Lalor, Brown and Cranfield 2000	3	Australia	VC system	Adult Not specified	Dysphagia	Assessment Real Time Remote	Feasibility not shown
8	Scheideman-Miller and Clark 2000	3	North America	VC system	Paediatric 3 – 10 years 9 participants	Language Articulation	Treatment Real Time Remote	Feasibility Acceptability
9	Katsavarus 2001	2+	Europe	VC system	Paediatric 4 – 5 years 12 participants	Language disorder	Liaison Real Time Remote	Feasibility Acceptability Cost implications

Table 2 (part 1 of 6): Speech and Language Therapy Services with published research findings

	Author/s and Date	Quality Rating	Location	System Used	Age Group	Clinical Need	Type of Service	Research Focus
10	McCullough 2001	3	Europe	VC system	Paediatric Pre school 4 participants	AAC – signing	Treatment Real Time Remote	Feasibility
11	Lemaire, Boudriza and Greene 2001	2++	North America	VOIP	Adult Age not specified 47 participants	Dysphasia Dysarthria	Assessment Real Time 11Remote	Feasibility Unacceptable Negative cost
12	Perlman and Witthawaskul 2002	3	North America	VOIP	Adult Age not specified Number not specified	Dysphagia	Assessment Real Time/SAF Remote	Feasibility
13	Sicotte, Lehoux, Fortier-Blanc and Leblanc 2003	3	North America	VC system	Paediatric 3 – 19 years 6 participants	Dysfluency	Assessment Treatment Real Time + remote	Feasibility Acceptability
14	Theodoros, Russell, Hill, Cahill and Clark 2003	2++	Australia	VOIP	Adult 20 – 70 years 10 participants	Dysarthria	Assessment Real Time/SAF F2F and Remote	Feasibility Reliability
15	Mashima, Birkmire-Peters, Syms, Holtel, Burgess, Peters 2003	2+	North America	VC system	Adult Age not specified 72 participants	Dysphonia	Treatment Real Time F2F and Remote	Feasibility
16	Brennan, Georgeadis, Baron and Barker 2004	2+	North America	Video using computer	Adult Age not specified 44 participants	Dysphasia Dysarthria	Assessment Real Time F2F and Remote	Feasibility

Table 2: (part 2 of 6): Speech and Language Therapy Services with published research findings

	Author/s and Date	Quality Rating	Location	System Used	Age Group	Clinical Need	Type of Service	Research Focus
17	Glykas and Chytas 2004	3	Europe	VOIP	Adult Paediatric Age and numbers not specified	Acquired Developmental	Treatment Real Time Remote	Feasibility Acceptability
18	Wilson, Onslow and Lincoln 2004	3	Australia	Telephone	Paediatric 3 – 6 years 5 participants	Dysfluency	Treatment Real Time Remote	Feasibility
19	Baron, Hatfield and Georgeadis 2005	2+	North America	VOIP	Adult Age not specified 44 participants	Dysphasia Dysarthria	Treatment Real Time Remote	Feasibility
20	Myers 2005	3	North America	VC system	Adult 45 – 76 years 3 participants	Dysphagia Voice	Assessment Real Time Remote	Feasibility
21	Pierrakeas, Georgopoulos and Malandraki 2005	3	Europe	VOIP	Adult Paediatric Age not specified Numbers not specified	Articulation	Liaison Real Time/SAF Remote	Feasibility Cost
22	Hill, Theodoros, Russell, Cahill, Ward and Clark 2006	2+	Australia	VC system	Adult 18 – 78 years 19 participants	Dysphasia Dysarthria	Assessment Real Time/SAF F2F and Remote	Feasibility
23	Theodoros, Constantinescu, Russell, Ward, Wilson, Wootton 2006	2+	North America	VC system	Adult Mean age of 73 10 participants	Articulation	Treatment Real Time/SAF Remote	Feasibility

Table 2: (part 3 of 6): Speech and Language Therapy Services with published research findings

	Author/s and Date	Quality Rating	Location	System Used	Age Group	Clinical Need	Type of Service	Research Focus
24	Waite, Cahill, Theodoros, Busuttin, Russell 2006	3	North America	VOIP	Paediatric 4 – 7 years 6 participants	Speech Disorder	Assessment Real Time F2F and Remote	Feasibility Reliability
25	Palsbo 2007	1+	North America	VC system	Adult 25 – 81 years 24 participants	Dysphasia Dysarthria	Assessment Real Time F2F and Remote	Feasibility
26	Howell, Triptoli and Pring 2007	2-	Europe	VOIP	Adult 63 – 72 years 3 participants	Dysarthria	Treatment Real Time Remote	Feasibility Acceptability
27	Ward, Crombie, Trickey, Hill, Theodoros and Russell 2007	2+	Australia	VC system	Adult 49 – 70 years 10 participants	Dysphagia Laryngectomee	Assessment Real Time F2F and Remote	Feasibility Acceptability
28	O'Brian, Packman and Onslow 2008	2-	Australia	Phone and email	Adult 22 – 48 years 10 participants	Dysfluency	Treatment Real Time/SAF F2F or Remote	Feasibility
29	Lewis, Packman, Onslow, Simpson and Jones 2008	1+	Australia	Telephone	Paediatric 3 - 5 years 9 participants	Dysfluency	Treatment Real Time/SAF Remote	Feasibility Cost
30	Styles 2008	2-	Europe	VC system	Adult 16 – 80 years 12 participants	AAC	Assessment Real Time Remote	Feasibility Acceptability
31	Theodoros, Hill, Russell, Ward and Wootton 2008	2+	Australia	VC system	Adult 21 – 80 years 32 participants	Dysphasia Dysarthria	Assessment Real Time F2F or Remote	Feasibility Acceptability

Table 2 (Part 4 of 6): Speech and Language Therapy Services with published research findings

	Author/s and Date	Quality Rating	Location	System Used	Age Group	Clinical Need	Type of Service	Research Focus
32	Tindall, Huebner, Stemple and Kleinert 2008	2+	North America	Video-phones	Adult 52 – 84 years 24 participants	Dysarthria	Treatment Real Time F2F or Remote	Feasibility Acceptability
33	Eriks-Brophy, Quittenbaum, Anderson, Nelson 2008	2+	North America	VC system	Paediatric 4 – 13 years 7 participants	Language Disorder	Assessment Real Time F2F and Remote	Feasibility Reliability
34	Hill, Theodoros, Russell and Ward 2009	2+	Australia	VC System	Adult 16 – 78 years 11 participants	Apraxia	Assessment Real Time F2F and Remote	Feasibility Reliability
35	Carey, O'Brian, Onslow, Block, Jones and Packman 2010	1+	Australia	Telephone	Adult Age and numbers Not specified	Dysfluency	Treatment Real Time F2F or Remote	Feasibility Acceptability
36	Grogan-Johnson, Alvares, Rowan and Creaghead 2010	2+	North America	VOIP	Paediatric Age not specified 34 participants	Language Articulation Dysfluency	Treatment Real Time F2F and Remote	Feasibility Acceptability
37	Constantinescu, Theodoros, Russell, Ward, Wilson and Wootten 2010	3	Australia	VOIP	Adult 65 years one participant	Dysarthria	Treatment Real Time Remote	Feasibility Acceptability
38	Constantinescu, Theodoros, Russell, Ward, Wilson and Wootten 2010	2+	Australia	VOIP	Adult 52 – 89 years 61 participants	Dysarthria	Assessment Real Time F2F and Remote	Feasibility Reliability

Table 2 (part 5 of 6): Speech and Language Therapy Services with published research findings

	Author/s and Date	Quality Rating	Location	System Used	Age Group	Clinical Need	Type of Service	Research Focus
39	Allen 2011	3	Europe	Email	Adult 19 – 52 years 16 participants	Dysfluency	Treatment support SAF F2F and Remote	Feasibility
40	Hein Ciccia, Whitford, Krumm and McNeal 2011	2-	North America	VOIP	Paediatric 2 – 6 years 264 participants	Phonology Language	Assessment Screen Real Time Remote	Feasibility Reliability Acceptability
41	Malandraki, McCullough, He, McWheeny and Perlman 2011	2+	North America	VOIP	Adult Not specified 32 participants	Dysphagia	Assessment	Feasibility Reliability

Table 2 (part 6 of 6): Speech and Language Therapy Services with published research findings

Client Group	Europe (n = 7)		North America (n = 21)		Australia (n = 13)	
	Adult	Child	Adult	Child	Adult	Child
Voice			1		1	
Dysphagia			3		1	
Dysphasia/Dysarthria	1		10		6	
AAC	1					
Dysfluency	1		1	1	4	1
Language/Articulation		4		5		

Table 3: Age and location of client groups using tele-technology Speech and Language Therapy Services

Table 3 sets out the continent location for the researched services in this review along with the communication impairment served and age group of the clients. The majority have been focused on those with acquired neurological conditions (1, 2, 3, 4, 11, 14, 16, 19, 22, 25, 26, 31, 32, 34, 37, 38). This has since expanded to include those with dysfluency (5, 6, 13, 18, 28, 29, 39); dysphonia (15, 20, 27); articulatory, phonological and language impairment (8, 9, 17, 23, 24, 36, 40); clients have included those using high tech and low tech alternative and augmentative communication systems (AAC) (10 and 30); and those with varying degrees of swallowing and feeding difficulty (7, 12, 19, 27, 41).

Three aspects of Speech and Language Therapy service – liaison, assessment and treatment – have been provided using videoconferencing tele-technology. Of the 41 Speech and Language Therapy services used in this review, only two used the tele-technology link solely for liaison (9 and 21), while the remainder have focused on providing either assessment or treatment; two services provided both assessment and treatment (13 and 37).

The majority of the 21 Speech and Language Therapy services that provided assessment did so for acquired communication impairments that included dysarthria, dysphasia and dysphagia. Only four of the 21 services provided assessment for developmental difficulties i.e. children; developmental communication difficulties covered included fluency (13) and articulation (24, 33, 40).

Nine of the Speech and Language Therapy services providing treatment to both adults and children used dedicated therapy programmes such as the Lee Silverman Voice

Treatment (LSVT) (23, 26 and 37) developed for use with dysarthric speakers; the Lidcombe Program developed for use with dysfluent children (5, 17, 22, 29) and the Camperdown Program used with dysfluent adults (28, 35); all three of these therapy programmes follow a set format for a set number of sessions using predesigned materials that are uncomplicated and repetitive; they were originally developed for use in a F2F therapy environment and were adapted for videoconferencing without compromising the integrity of the original programme design or needing to alter the predesigned materials.

Tele-technology has been used to provide the full range of Speech and Language Therapy service – liaison, assessment and treatment – and whilst still predominantly used by Speech and Language Therapy services for adults with acquired language difficulties, its use has been gradually extended to children and developmental communication impairments.

2.5 Evaluation of Speech and Language Therapy services using tele-technology

The Speech and Language Therapy services listed in Table 2 carried out research to address three broad questions: 1) the feasibility of providing their specific Speech and Language Therapy service through tele-technology: for Speech and Language Therapy services focused on assessment, the evaluation was a comparison of the assessment of the same client in both F2F and through video-conferencing by different therapists; for those services providing treatment there was a need to demonstrate that progress and change could be achieved; 2) the acceptability of providing their specific Speech and Language Therapy service through tele-technology to the clients or users; in some studies this extended to acceptability for clinicians providing therapy through tele-technology; 3) a primary identified benefit to Speech and Language Therapy services provided using tele-technology – actual costs to provide. The three areas of feasibility, acceptability and cost are considered separately.

2.5.1 Feasibility

Of the 41 studies listed, 39 found that tele-technology could provide Speech and Language Therapy whether that aspect of service was assessment, treatment or liaison. The two that were not successful in showing feasibility both provided assessment for those with a feeding/swallowing difficulty (7, 27).

However, the remaining 19 of the 21 Speech and Language Therapy services that focused on assessment found that there were no differences between the remote and F2F therapist rating of a client's communication difficulty (2, 3, 4, 11, 12, 13, 14, 16, 20, 22, 24, 25, 30, 31, 33, 34, 38, 40, 41). The two Speech and Language Therapy services that did not demonstrate equivalent assessment for clients were both based in Australia and both were assessing swallowing difficulty. The first (7) raised concerns that the quality of the video and limited camera manoeuvrability reduced the accuracy of diagnosis; the second (27) raised the same concerns, despite improvements in technology in the seven years between the two studies; both used a dedicated video-conferencing system considered to provide better and more reliable audio and video quality than desktop video-conferencing systems (VOIP). However, it may well be that to assess swallowing it is necessary to have physical contact with the patient in the assessment process.

The 18 Speech and Language Therapy services that provided treatment through tele-technology all concluded their services were as effective as the F2F equivalent (1, 5, 6, 8, 10, 15, 17, 18, 19, 23, 26, 28, 29, 32, 35, 36, 37, 39) because the clients made progress measured on either formal assessment or a standardised protocol specific to the therapy programme used (Camperdown/Lidcombe/LSVT). Some of the studies specifically identified additional benefits that had not been anticipated had the client accessed only F2F Speech and Language Therapy e.g. increased confidence (16); for physically disabled clients, accessing the Speech and Language Therapy service through tele-technology was a more effective use of their effort in time and physical energy, especially since shorter but more frequent sessions were provided (26, 31, 37).

Unsurprisingly the two services that provided liaison (9, 21) showed that they could provide this service successfully.

2.5.2 Acceptability

None of the 15 research papers in the literature review that had investigated or discussed acceptability and satisfaction (1, 6, 8, 9, 11, 13, 17, 27, 30, 31, 32, 35, 36, 37, 43) specifically defined either term. Tindall et al (2008) used the term satisfaction interchangeably with acceptable and this was the only paper to define satisfaction; their definition of satisfaction, with any health service, was an equation; care expected by the patient had to equal care received and if it did not, was described by them as 'unacceptable'. This suggests that being acceptable has less value than any rating of satisfaction; a service or aspect of service that is rated as acceptable meets the minimum criteria to be considered satisfactory because it satisfies the patients' requirements (13, 17, 27); dissatisfaction with a health service is described in terms of unacceptability (11, 27) and degrees of satisfaction are a rating that is above the minimum level of service that is acceptable.

Questionnaires were principally used to determine levels of satisfaction and therefore acceptability, for clients and carers using a Speech and Language Therapy service provided through tele-technology. All of them focused on the ease of using the technology and the audio and visual acuity; some asked about the therapy itself (8, 17, 13, 27, 32, .35, 36); some asked about the interaction directly (13) or indirectly (9, 27, 30, 32); others about their level of comfort and attitude towards the experience (6, 11, 31, 36, 37, 40); none of them asked for a view on the costs to provide although feedback from some of the questionnaires reported that this therapy using tele-technology was convenient (31, 35); in one a specific question about satisfaction with the whole service was asked (31) and two others asked participants for an acceptability rating for the whole service (30, 32).

None of the 16 services that investigated satisfaction (1, 6, 8, 9, 11, 13, 17, 26, 27, 30, 31, 32, 35, 36, 37, 40) reported any negative feedback from their service users and reported that clients and carers found the tele-technology both acceptable and

manageable. However, in some of the studies, participants were only able to attend remote Speech and Language Therapy sessions and were not offered F2F Speech and Language Therapy (1, 8, 9, 13, 30, 32, 35, 37); it is not clear in these studies if the participants had had any previous experience of F2F therapy prior to the study. Potentially with F2F therapy either impracticable or impossible to schedule satisfactorily, there is a potential bias in the clients' views if they have no experience of F2F Speech and Language Therapy. In only a few of the studies did the participants experience both F2F and remotely delivered Speech and Language Therapy (22, 23, 26, 36) and in one there was potential for a bias as the participants were required to supply and fund not only the computer and appropriate internet connection but also the research specified peripheral equipment (26).

There were more reservations expressed by the therapists who had experience of working both F2F and remotely. These reservations focused on the quality of the technology; therapists wanted the remote therapy to be identical to working F2F (11 and 27); in both these studies the same therapist provided the sessions using the video-conferencing technology and F2F; concern was raised on the quality of the audio and visual acuity and its adequacy for Speech and Language Therapy; improving the quality was possible but only if patients travelled to a health centre with more sophisticated video-conferencing technology but that would mean patients were not necessarily in their most immediate environment and still had the burden and also the cost of travelling without seeing the therapist F2F. Therapists do not intuitively recognise that using tele-technology, whilst changing their current familiar work practice could lead to a new way of providing therapy and working that would still be as satisfying (Taylor, 1998).

2.5.3 Cost

Only four of these studies specifically collected data on the cost of providing their service (9, 11, 21, 29). They all calculated the cost of providing their service by recording work activity and in one instance equipment set up costs (9). Three identified an obvious cost benefit - the reduced cost of travelling either for the therapist, the client, or both (9, 21, 29). However, one paper (11), specifically reported

that there were no financial savings to be made providing Speech and Language Therapy through tele-technology but this study only logged the time to provide the session and none of the other activity that is necessary to provide the Speech and Language Therapy session whether F2F or provided remotely. Another reported no cost benefits to remotely provided Speech and Language Therapy (29); in this study increased costs to provide the Speech and Language Therapy session were estimated at three times the length of the actual session but as no F2F sessions were provided to the clients or a control group, no direct comparison could be made; despite this increased cost in therapist time, the benefits to the patient who could not access this service F2F were considered to outweigh the additional costs to the Speech and Language Therapy service. The other two services (9, 21) used complex video-conferencing technology primarily to liaise; both these services provided a service to a wide geographical area where the costs of travelling to the remote locations was high not only because of the actual transport costs but also the travelling time and the consequent loss of clinical time.

2.6 Appraisal of the Research

All the studies included in Table 2 were graded using the SIGN guidelines, first for the type of research methodology used and second, for the quality of their research process. The studies were divided into two groups - those graded with one or two, a total of 24, formed the first group and were considered more robust; the remainder, totalling 17, formed the second group and were considered less robust; the papers in both groups were reviewed to identify the focus of their questions, participants, methods, analysis and dissemination.

2.6.1 Methods used by other research into Speech and Language Therapy provided through tele-technology

All 24 research studies in the first group focused on the feasibility of carrying out a specific aspect of Speech and Language Therapy service using tele-technology – liaison, assessment or therapy – as determined by ASHA (2005); three considered costs to provide (9, 11, 29) and ten the acceptability of Speech and Language Therapy provided

using a tele-technology link (9, 11, 26, 27, 30, 31, 32, 35, 36, 40); of those ten only two considered the therapists' point of view (11, 27). In the second group of 17 studies, all focused on feasibility, one included cost to provide in the research question (21) and six investigated participant acceptability (1, 6, 8, 13, 17, 37).

In the first group, 19 of the 24 studies worked with adult participants; the majority of these had acquired communication difficulties such as dysphasia, dysarthria and dysphonia (4, 11, 14, 15, 16, 19, 22, 23, 25, 26, 31, 32, 34, 38); others for clients with dysfluency (28, 35); one with high tech alternative and augmentative communication (AAC) needs (30) and two with dysphagia (27, 41) seven of the 19 papers were focused to deliver Speech and Language Therapy treatment programme and these were for dysfluency, voice and dysarthria; six of the seven used a specified organised treatment protocol – the Lee Silverman Voice Treatment (19, 23, 26, 32) or Camperdown Treatment Programme (28, 35) whilst just one provided treatment that did not follow a specific proramme (15); the remainder provided assessment (4, 11, 14, 16, 22, 25, 27, 30, 31, 34, 38, 41). Five of the 24 studies in the first group worked with children – two provided assessment (33, 40), two provided treatment (29, 36) and one liaison (9). The same pattern was reflected in the second group with nine studies working with adult participants (1, 2, 3, 6, 7, 12, 20, 37, 39), 6 with children (5, 8, 10, 13, 18, 24) and two working with both adult and child participants (17, 21); there was an equal spread of Speech and Language Therapy activity provided in the research projects in the second group – four of the studies working with adults provided treatment (1, 6, 37, 39) and five assessment (2, 3 7, 12, 20) whilst four of the six child studies provided treatment (5, 8, 10, 18) and two assessment (13, 24); one of the research studies that worked with adults and children provided treatment (17) whilst the other liaison (21).

Fourteen studies in the first group, evaluated the feasibility and accuracy of assessment by assessing the client both F2F and using the tele-technology with two therapists; success was determined by the level of agreement in the assessment by the two therapists. Five did not evaluate the experience for the users, nine used questionnaires to determine what the clients thought of the assessment (4, 11, 16, 27, 30, 31, 34, 38, 40); none of these Speech and Language Therapy services continued so that the participants had only one possibly two experiences of Speech and Language

Therapy provided remotely; the questionnaires were generated by the researchers and ranged from 5 to 14 questions; only two (30, 32) used questions trialled by other research.

In the first group 10 studies that evaluated treatment assessed the participants before and after the treatment with specific measurable parameters such as loudness, articulation accuracy that could be used in both session formats; in two the clients were asked to rate that aspect of their speech that was the focus of treatment (15, 28). Six of the studies asked for the views of the participants using a questionnaire (9, 23, 29, 32, 35, 36) and two asked for their views using an interview (9, 19). None of the studies working with children asked specifically for their views. The questionnaires were in all instances presented after the trial – whether one or several therapy sessions using tele-technology had been experienced. Both studies that used interviews to collect data (9, 19) were carried out after the trial of sessions was over; the parents of preschool children (9) were interviewed although they had no experience of the remote or F2F Speech and Language Therapy service as the sessions were located in their child's school and they were not present; the other study that used an interview followed a strict format of six questions (19) administered after the last session.

Of the 24 studies in this first group, only one considered interaction (9) to inform the acceptability of the technology; the topics in the verbal exchange between the therapist and the adult at the remote end were coded and the data were used to support the acceptability of the technology because there was little discussion on the technology and no discussion of any problems using the technology. This approach did not evaluate the purpose or sentence types but solely the topic of conversation. One other study (36) recorded the number of therapy objectives completed in both session formats throughout the trial period and concluded more objectives were completed for those participants that were provided with Speech and Language Therapy using the tele-technology. Three studies calculated the costs to provide by recording the time taken to provide specific sessions (9, 11, 21).

In the second group of 17 studies, only those that provided treatment evaluated their service with a questionnaire (1, 8, 10, 13, 18, 37); all participants were asked to complete a questionnaire after the treatment sessions were completed; none of the studies in this group used interviews; one of these studies (13) used a session profile to record the participants' attendance as an indication of satisfaction with the Speech and Language Therapy service using tele-technology. The remaining 11 studies relied on therapist assessment of clients in the F2F and remote therapy sessions (2, 3, 7, 20) or on the therapist rating their clients' progress (5, 6, 17, 21, 39) and for two a combination of the two (12, 24).

As Hill and Theodoros observed in their review (2002), most of the studies used descriptive statistics; greater authority for the results and more credence to the conclusions would be given if more sensitive statistical analyses were used. Examining the 24 studies in the first group, there would appear to be a trend moving away from solely using descriptive statistics; 14 used a range of statistical tests (9, 15, 16, 19, 22, 23, 26, 29, 31, 32, 34, 35, 38, 43) whilst ten relied on descriptive statistics alone (4, 11, 14, 25, 27, 28, 30, 33, 36, 40). In the second group, six of the 17 studies did not report any statistical evaluation (7, 12, 20, 21, 37, 39), ten used descriptive statistics alone (1, 2, 5, 6, 8, 10, 13, 17, 18, 24) and one used more sophisticated statistical tests (3).

The research studies in the first group were published in a wide range of peer reviewed journals; 11 were published in journals focused on using tele-technology as a form of delivery - the Journal of Telemedicine and Telecare and the Telemedicine Journal and e-Health (11, 14, 16, 23, 25, 27, 30, 31, 32, 36, 40), whilst nine were published in journals more closely associated with the Speech and Language Therapy profession whether based in the UK or the USA (15, 22, 26, 28, 29, 34, 35, 38, 43); one had never been published (9) and one was published through the organisation's own publicity mechanism (4); two were published in journals concerned with a specific clinical focus – Aphasiology (19) and Clinical Linguistics & Phonetics (33). In the second group six of the studies were published in journals closely associated with the Speech and Language Therapy (6, 13, 17, 24, 37,39), five in journals focused on tele-technology (1, 5, 7, 10, 18), whilst three were published in journals with a specific clinical focus (2, 3, 12) and three were published by the authors themselves (8, 20, 21).

2.6.2 Drawbacks with the Research Methods used

Both Hill and Theodoros (2002) and Reynolds et al (2009) who have reviewed Speech and Language Therapy studies that have investigated the use of tele-technology to provide an aspect of Speech and Language Therapy service, concluded that no large scale studies had been carried out; neither specified what would be the appropriate sample size and only rarely can studies investigating Speech and Language Therapy use randomised controlled trial methods because the numbers requiring therapy, whilst increasing are not large enough and combined with the logistic issues of location, aetiology has not proved practical yet.

Both these review papers concluded that there was a lack of detail in the papers; Hill and Theodoros (2002) went further and stated that it would not be possible to replicate any of the studies that they had reviewed. Whilst the detail was vague it was clear that a number of investigative methods had been successfully used; these included pre and post treatment measures, simultaneous assessment by therapists in the two session formats of the same participant and post trial questionnaires.

In the three studies that had a grading of 1 and had used blinding and a randomised controlled trial, two were evaluating treatment (29, 35) and one assessment (25); for all three an organised treatment programme was used – LSVT, Camperdown and Lidcombe Programmes, so that it became both possible and practical with therapists trained to manage a set scheme to offer all the participants the same level of service; without a set format and beyond assessment, a set level of service cannot be guaranteed (Reynolds et al, 2009).

2.6.2.1 Specific Measures

The F2F and online equivalent Speech and Language Therapy services were largely pitted against each other. In those studies investigating assessment, there was a one off approach that investigated solely the accuracy of assessment carried out online or F2F; in those instances there were no control groups used and the participants were

experiencing F2F and online assessment simultaneously; they were located in a hospital or other health service building with professional support but not in a location convenient and comfortable to them; those participants that were then asked about their level of satisfaction were limited by their experience of online and F2F Speech and Language Therapy. Equally the same criticism could be extended to the studies that evaluated Speech and Language Therapy treatment provided through tele-technology because participants did not necessarily experience both session formats.

The pre and post trial assessments of the participants who had followed a treatment programme were an established part of those therapy programmes and focused on specific measurable aspects of speech – fluency and volume; the measurements were objective i.e. the number of fluency breaks pre and post treatment, loudness measured with instrumentation pre and post treatment. In those studies that used LSVT, the questionnaires used had been devised by the LSVT programme and focused not on the provision of the programme through tele-technology but solely the actual parameters of the programme itself.

There was limited use of interviews and in both instances when interviews were used (9, 19) it was to ensure that data were collected from those participants; there was no involvement of the child participants in those studies that provided a Speech and Language Therapy service to children when interviewing could have been used. The questionnaires used were short using one question only to determine participant satisfaction and often directly asked about acceptability of the Speech and Language Therapy service provided through tele-technology rather than considering what could make a service acceptable or unacceptable such as the audio and visual acuity, number of interruptions, convenience, activities, preparation, interaction. The questionnaires were devised by each research project apart from two (30, 32) who used a questionnaire that had been already developed to assess the acceptability of tele-technology to provide healthcare services (Yip, Chang, Chan and Mackenzie, 2003). This questionnaire presented the questions randomly and asked for a yes or no response unlike the other studies, which used at least three answer options, and in some instances a five point Likert scale.

Apart from one study (9), none of the 41 studies had investigated interaction to identify similarities and differences. The coding used by Katsavarus (2001) had coded only the online Speech and Language Therapy session and the coding was focused on the topics raised; this was cleverly used to rate the difficulties in using and managing the technology. There has been limited collection of data from treatment sessions; one study (13) used the participant attendance as a measure of participant satisfaction, which is not an obvious link – non attendance might be a consequence of other priorities in a participant's schedule, illness or no support for Speech and Language Therapy involvement. Just one study (36) collated objectives completed over a period of Speech and Language Therapy, F2F and online but this was a single measure and not combined with any other measures.

Recording the time to provide a specific session is logical but in the Lemaire et al (2001) only the consultations - F2F and online - were recorded with no acknowledgement of the other work activity that is used to provide the actual consultation such as travelling time and preparation of materials; this study concluded that there was no cost saving to providing an online service as the online sessions were not shorter than the F2F sessions. The Katsavarus study was more thorough and accounted for the travelling time necessary although no measuring of other activity needed to provide a service such as the preparation for the session and case note writing (9).

The use of tele-technology is limited by those willing to invest in the changes to work practice and also participant recruitment. Reduced therapist and participant numbers have limited the research methodology used. In the 41 studies collated in this review, there has been consistent use of assessments often using blind research methods along with post trial questionnaires. There has however, been limited use of interviews, limited attempt to collate costs to provide Speech and Language Therapy remotely and limited attempts to evaluate the remotely provided Speech and Language Therapy through on-going measures not linked to the therapy programme alone; questionnaires have been devised with each study, kept short and limited in the aspects of service evaluated.

2.7 Factors impacting on the use of tele-technology to provide Therapy

The research findings to date have not just reported on the feasibility of using tele-technology to provide Speech and Language Therapy for different age groups and communication impairments but also the maintenance of quality (22, 26), acceptance of the remote interaction (21, 30) and identifying budgetary benefits (9, 21). Demonstrating the feasibility of providing a service and its acceptability to clients positively has not secured the continued use of tele-technology to provide therapy. In the UK there are two services that currently use video-conferencing and these are located in largely rural areas where the travelling precludes a regular Speech and Language Therapy service: Dorset and the Orkney Isles. Both are under constant threat with expensive fixed videoconferencing systems to maintain and also a lack of therapists trained and confident to use the technology (Randall, 2008). As with other health services pioneering the use of tele-technology, there is still the need to enlist the support of the individual profession (39) to establish and run a service delivered using tele-technology.

2.7.1 The American Therapist View of Tele-technology

For over thirty years in North America, therapists have been using tele-technology. ASHA carried out a survey of their membership in 2002 specifically into the use of tele-technology to provide their services. The ASHA has a membership of 145,000 that includes both Speech and Language Therapists and Audiologists; the survey was directed to 5,895 of its members, selected at random and split between the two professions; 1,667 of those invited to participate in the survey responded.

A small number of the participants – 250 - 15% of the total number, reported that they had used some form of tele-technology through their clinical work. The responses showed that there was an interest to use tele-technology to provide services. However, ten concerns or barriers were identified from the therapist responses and these are set out in Table 4. The table shows an even spread between four barrier groups – professional, tele-technology, clinical and cost. For Speech and Language

Therapy services to be provided using tele-technology, these barrier groups need to be addressed; some already have been and those are indicated with a tick in Table 4. Points 2, 3 and 4 are professional issues that have been addressed by ASHA in their technical guidelines and Professional Practice Guidelines (2005) and are specific to North American practice.

Barrier Identified from the ASHA Survey		Barrier Group			
		Professional	Technology	Clinical	Cost
1	Purchase Costs of Technology				✓
2	No professional guidelines specific to tele-technology	✓			
3	Ethical issues i.e. client confidentiality and registration to practice	✓			
4	Malpractice issues	✓			
5	Lack of data demonstrating clinical effectiveness			✓	
6	Change to Work practice – admin/materials			▪	
7	Managing client's technology		▪		
8	Lack of therapist training to use tele-technology		▪		
9	Loss of rapport and interaction			▪	
10	Reimbursement difficulties				▪
Key: ▪ = addressed by ASHA ▪ = remaining therapist concern					

Table 4: Barriers to using tele-technology to provide Speech and Language Therapy

2.7.2 Professional Barriers

Mashima and Doarn (2008) in their review highlighted that a number of the barriers raised in the ASHA survey have since been addressed. As a result of the survey in 2002, ASHA in 2005 produced comprehensive professional guidelines for their membership which covered a wide range of issues including the most suitable form and type of technology, knowledge and skills of the therapist, patient selection, use of support personnel, documentation, evaluation of effectiveness, licensure, liability and malpractice, privacy and security along with reimbursement (ASHA, 2005). These professional guidelines addressed comprehensively the professional issues that were seen as barriers in the original ASHA survey.

Only one other professional body, the Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA) has produced any professional guidance by adopting the ASHA Professional Guidelines. As yet there is no equivalent professional guidance in other countries that are beginning to use tele-technology. In the most recent RCSLT Professional Guidance (2006) no mention was made of tele-technology. This lack of professional guidance, and with it recognition from the national professional Speech and Language Therapy representative body, may limit the development of Speech and Language Therapy services using tele-technology. In North America, where the professional bodies have developed or adopted professional guidelines, there are many emerging Speech and Language Therapy services using tele-technology designed for long term development; in other parts of the world, including the UK where there are no professional guidelines, Speech and Language Therapy services using tele-technology have only been established for limited time periods specifically to carry out research (9, 10, 26, 30).

2.7.3 Technology Barriers

All forms of technology, including videoconferencing systems, are continually advancing, with improvements in their use, range of function, their format, and design as well as becoming less expensive to purchase and run. However, despite these improvements and despite a wealth of advice on various systems (Gough, 2006), there is little in the professional Speech and Language Therapy literature to guide the selection of a system and peripheral equipment, how it should be set up for the best visual and audio acuity, and how to manage the verbal and non-verbal aspects of interaction (Styles, 2008).

2.7.4 Clinical Barriers

2.7.4.1 Interaction and Rapport

Being able to interact appropriately with clients is a vital skill for any health professional as it creates the relationship or rapport necessary to take an accurate case

history, direct active or passive treatment and support and guide change in a client's lifestyle. The interaction skill of any health professional is key to being effective (Miller, 2011).

The therapist concerns in the original ASHA survey that interaction and therefore rapport would be lost would seem to differ from the client feedback. Interaction is undoubtedly altered when the conversation participants, whilst able to see each other and interact in real time, are not in a shared location. Although Speech and Language Therapy tele-services have asked clients and sometimes the therapist to evaluate the remotely conducted conversation, none have specifically identified what features alter in a remotely conducted conversation. Understanding the changes that happen and how interaction can be most effectively managed is important in developing wider use of tele-technology to provide health services (Miller, 2011). Despite alteration to the interaction, clients have reported finding the videoconferencing service format acceptable including remotely conducted conversation (Styles, 2008).

Bruce (1996) identified that the integration of audio and visual information in a remotely conducted conversation was not vital to maintaining an appropriate conversational flow - minimising utterance repeats, extended turns and interruptions as well as changes in topic. Her research specified that the flow in remotely conducted conversation was changed and 'broke down' if the visual information was delayed by more than 80 milliseconds, although for a remotely conducted conversation reliant on lip reading, synchronised audio and visual information was identified as vital. Whilst conversational flow is still achievable through remotely conducted conversation, it differs from F2F conversation even with the best audio and visual acuity and connection possible (O'Malley et al 1996). In their research, O'Malley et al asked undergraduate students to work in pairs to construct an object following set directions; they did this either F2F or through a video conferencing link although both students were in the same building. They concluded that a lack of 'social presence' in the remotely conducted conversation led to longer utterances, increased eye gaze as well as more interruptions. Other research has supported these findings and concluded that visual contact in remotely conducted conversation is vital for specific types of communicative purposes such as negotiation (Anderson et al, 1996).

Research evaluating education provided through videoconferencing has shown a change not only in the teacher's language but also the children's language (Falck et al, 1997); the teachers used more questions and made more repetitions whilst the children were perceived to be more passive (Falck et al, 1997). Research has also identified what those in remotely conducted conversation need to adjust. This includes not just the pace i.e. timing of the conversation turns and eye contact but also the use of gesture to enhance their message (Caraville and Mitchell, 2000). It is necessary to adapt their communication skills to direct the attention of a remote communication partner (Williams et al 1998). Change does not necessarily mean that the interaction is any less effective but being certain about how the communication is managed in the same clinical situation both F2F and through tele-technology is essential for any professional providing their service. It is through interaction that a therapist establishes rapport and trust as well as managing the therapeutic situation with instructions and prompts because physical and visual prompts are removed or limited.

Experimental research with undergraduates using video-conferencing to communicate with others to complete a range of tasks such as constructing an item or completing a puzzle, has identified a number of key features in remotely conducted interaction (Anderson, Newlands, Flemming, Doherty-Sneddon, Van der Velden, 1996; O'Malley, Langton, Anderson, Doherty-Sneddon and Bruce, 1996; Bruce, 1996). When compared with F2F interaction completing the same tasks, some differences were observed; fewer interruptions in the video-conferencing interaction were noticed (Anderson et al, 1996); fewer words and turns were used in the video-conferencing interaction to complete the same task as was used in the F2F interaction (Anderson et al, 1996); equal turns used by both speakers in the video-conferencing task (O'Malley et al, 1996); in a typical, relaxed F2F interaction there were more interruptions and shorter utterances so that fewer interruptions and longer utterances suggested a more formal interaction situation (O'Malley et al, 1996) that mirrored the interaction in the video-conferencing situation.

2.7.4.2 Time

In the original ASHA survey (2002), one perceived barrier, to the use of videoconferencing to provide Speech and Language Therapy, was the pressure it would create on clinical time. Providing any health service through tele-technology requires changes to familiar working practice and health professionals will require effort to adapt well-practised routines (Miller, 2011). The ASHA survey implied that finding time to adapt materials and adjust the working routine was a concern for the therapists. The therapists' concern was also focused on whether therapy sessions conducted remotely achieved the same activity as those conducted F2F, although research on educational services would suggest that educational activity through videoconferencing not only achieves the same measurable outcome (Falck et al, 1997) but can lead to measurable benefits such as better quality work (Cifuentes and Murphy, 2000).

Speech and Language Therapy services for which research is available have predominantly provided either assessment or treatment as opposed to liaison which is just provided by two (Katsavarus, 2001, Pierrakas et al, 2005). In these services providing therapy, programmes were followed that used an organised routine with no requirement for additional materials and no need to adapt materials or identify how to use the therapy materials in the remotely provided Speech and Language Therapy format e.g. Lee Silverman Voice Treatment (LSVT), Lidcombe and Camperdown Programmes. Hill and Theodoros (2002) in their review suggested that future research must evaluate both the therapy materials and the technological equipment used. They referred to an evaluation process developed by Yawn (2001) to systematically identify the minimum sensory and technical requirements needed to use equipment. This evaluative process was designed with medical equipment in mind and would not easily apply to materials typically used by a Speech and Language Therapist whether working with adults or children. However, without a range of materials ready to use in remotely conducted therapy, it is difficult to envisage that Speech and Language Therapy will move to this form of service delivery (D. Randall, personal communication, July 2008).

2.7.5 Cost Barriers

Many of the reviews of tele-health services have highlighted the need for cost effective or cost benefit analyses (Roine et al, 2001; Hailey et al, 2002; Jennett et al, 2003; Hailey, 2005). The same need has been highlighted in reviews of the Speech and Language Therapy tele-technology studies (Hill and Theodoros, 2002; Theodoros, 2008; Mashima and Doarn, 2008). Costs differ based on the level of technical specification – dedicated videoconferencing system with multiple ISDN lines or a desktop system using peripheral equipment such as headphones and web camera - as well as the costs necessary to train the therapists to use the equipment along with the costs involved in purchasing or adapting materials, and also the associated running costs that may include internet provider fees, telephone calls and charges, video-conferencing system charges, technical engineer salaries, equipment maintenance, and repair charges.

These need to be balanced against benefits that lead to the same level or greater clinical/work effectiveness (Waite et al, 2006, Theodoros et al, 2008). These benefits can be linked to the therapeutic process – materials, managing equipment, enjoyment, generalisation, communicative opportunities, more time with the therapist, easier access to the therapist, sharing of materials. Alternatively, benefits can be linked to administrative and budgetary considerations – with less time spent on travelling there is potential for increased time for other liaison, report writing as well as continuing professional development (CPD) activity and general administration tasks; with reduced travel costs there is potential to purchase the necessary training, equipment and materials.

2.8 A UK Survey of Therapist Working Practice and Attitude to the use of Tele-technology to provide Speech and Language Therapy

The immediately identified advantage to using tele-technology is the saving in time and the costs of travel that could enable more patients to work directly with a Speech & Language Therapist. However, there have been no published reports describing how therapists currently use their clinical time to know if this might be correct. To identify

the potential impact of using tele-technology on a therapist's work activity, a questionnaire survey of UK based therapists was carried out to find out how therapists' used their time to provide their service (Matthews, 2009). As there had been no equivalent to the ASHA survey (2002) of UK therapists, the questionnaire also asked questions to identify what technology the therapists used in their clinical practice, their knowledge of medical and Speech and Language Therapy services using tele-technology as well as their views about using tele-technology to provide Speech and Language Therapy.

2.8.1 Survey Methodology

The survey questionnaire was presented through the online Survey Monkey website (www.surveymonkey.com) in the interests of time efficiency; the website managed the questionnaire, the participant invitation and collated the results. Each participant was invited by email to complete the questionnaire with a link in the email to the survey on the Survey Monkey website. The survey was live for three months from December 2008 to March 2009. Once a therapist had completed the survey a thank you email was sent and at the end of January, a second email invitation was sent out to those that had not completed the survey. A total of 39 therapists completed the questionnaire.

2.8.1.1 Participant Recruitment

In a previous questionnaire survey (Matthews, 2001), the annual Royal College of Speech and Language Therapist (RCSLT) Member Directory had been used to randomly select and invite practising therapists to participate; these therapists were listed in the 'currently practising' section of the Directory. However, the RCSLT Directory is no longer produced and available to an individual member of the RCSLT. Instead the website database of the Association of Independent Speech & Language Therapists in Practice (ASLTIP) was used to locate therapists from across the UK; even though participant recruitment through the ASLTIP database was potentially selecting a biased group of therapists working outside of the NHS, independent therapists represent 10% of the practising profession. The ASLTIP database can select therapists based on

postcode, communication impairments treated and patient age group; the postcode and patient age were used in the database search and therapists selected at random and included if they had an email address. All ASLTIP therapist members are registered with the Health Professions Council (HPC) and the RCSLT and by advertising through the ASLTIP database, currently practising.

A total of 100 therapists were selected, 50 worked with adults and 50 with children and represented at the time 12% of the ASLTIP membership; every effort was made to ensure that there were therapists from every county in the UK although not necessarily achievable as some counties had many more independent practising therapists than others.

Forty percent of the group, whilst ASLTIP members, were also employed in the NHS; the remainder worked outside of the NHS for charitable or independent organisations. The solely independent based therapists worked in rural, urban or mixed geographical bases whilst those employed by the NHS reported that they worked only in urban areas with just a few working in both urban and rural localities and none in a predominantly rural locality. There were an equal number of therapists working with adults and children; closer analysis showed that two thirds of the NHS based therapists worked with children and two thirds of the independent therapists worked with adults.

2.8.1.2 Survey Design Measure

A questionnaire with 14 questions was designed and set out in three parts. The first part of the questionnaire asked questions about the therapist's employment and caseload; these questions included the year that they qualified, their principal employer, service location, caseload age group, communication impairments and number on their caseload and also principal work base. The second part of the survey focused on the therapist's work activity; this was made up of two questions; the first identified work activity of the previous week and the second asked how much work time was spent working directly with patients, travelling, carrying out any activity that could be linked to a specific patient, general administration and CPD.

In the third part of the questionnaire the therapists were asked to identify what technology they used to deliver their services, whether they were aware of any medical or Speech and Language Therapy service using video-conferencing and whether they considered it possible to use video-conferencing including desktop videoconferencing to provide any aspect of their service. In the final question the UK therapists were asked to rate their agreement to 12 statements on a 7 point Likert scale (Table 5). These statements were a combination of the original questions and observations made by the therapists completing the original ASHA survey (2002).

The questions were trialled first by two local therapists to check for the clarity in the questions, instructions and layout and with amendments trialled for a second time by two therapists, one employed by the NHS and the other by a Private Healthcare Company.

	Statement	Barrier Group
1	Using Skype could not improve my work routine	Cost
2	Using Skype could make a difference to clinical time	Clinical
3	Using Skype could be more convenient for my clients	Clinical
4	I could offer more flexible appointments for clients using Skype	Clinical
5	Skype could not be as effective as face-to-face sessions	Clinical
6	Using Skype could reduce the pressure on my workload	Clinical
7	Skype is not feasible because of a lack of materials	Clinical
8	There would be no loss of privacy using Skype to provide therapy	Professional
9	Rapport could still be maintained with my clients using Skype	Clinical
10	There could be a loss of contact with other professionals if using Skype	Professional
11	Skype equipment is affordable	Cost
12	Skype technology is too complicated and difficult for my clients or I to use	Technology

Table 5: Questions to identify views of UK Therapists on the use of tele-technology

2.8.2 UK Therapist Working Practice

The purpose of the survey was first, to establish the clinical and other activity that therapists carry out in a typical working week, and second, the amount of time used for these activities in a working week. It was not anticipated that any of the therapists participating in this survey would be working for the NHS because locating participants was made through the ASLTIP data base; so when it emerged that 40% of the

participants were working for the NHS, a third focus to identify any differences between therapists based on caseload characteristics such as total number and types of communication impairments, along with geographical nature of the area worked, was included. However, taking advantage of the opportunity to compare work time for therapists based in the NHS against those working independently was not possible as no data had been collected to identify the hours worked for those that were part time. Ultimately it was only possible to provide a description rather than a comparison of the caseload and work practices.

The majority of therapists whether NHS or independent worked with more than one clinical group. The NHS based therapists reported that they had caseloads in a range of 12 to 100 with a mean of 43; the range for the independent therapists was 2 to 65 with a mean of 19. Table 6 sets out the characteristics for the independent and NHS therapists. Some differences emerged; the majority of the NHS therapists had qualified after 1990 whilst those working independently had largely qualified before 2000. The majority of the NHS therapists were based in urban geographical locations whilst the independent therapists considered themselves to be based in both urban and rural locations; the independent therapists selected patient's home as a primary work location whilst none of the NHS therapists did.

Therapist/Caseload Characteristic		Employer	
		Independent	NHS
Year Therapist Qualified	Before 1980	8	1
	1980 – 1989	7	0
	1990 – 1999	7	6
	After 2000	1	9
Geographical Descriptor	Urban	3	10
	Rural	5	0
	Both	15	6
Caseload Age	Paediatric	9	10
	Adult	7	6
	Both	7	0
Principal Work Base	Hospital	1	4
	Clinic	7	10
	Mainstream School	0	1
	Special School	5	1
	Patient's home	10	0

Table 6: Therapist and caseload characteristics of survey participants

Both therapist groups reported that their work time was primarily focused on activity linked to the client with the least time spent on administrative tasks and CPD activity.

This survey can only be speculative as it was completed by a small sample; using the ASLTIP database to locate participants interestingly provided participants that worked in the NHS as well as the independent sector, which had not been anticipated. It would seem that the NHS therapists were more likely to be urban based with large caseloads and therefore less likely to use any substantial amount of their time travelling to provide their service than the solely independent therapists. The therapists were not asked how far clients travelled to them but reducing the burden of travelling for therapists has the potential to enable more clients to be seen in the same available working time.

2.8.3 UK Therapist Knowledge and Attitude to video-conferencing

Thirty of the 39 therapists that had answered questions about their use of work time in the online survey completed the full questionnaire. These therapists worked in a variety of work settings and geographical locations; 18 (60%) worked independently and 12 (40%) worked within the NHS. Just three (10%) of the therapists knew about any medical, health or Speech and Language Therapy service using tele-technology to provide a part of their service; 18 (60%) participants did not consider that videoconferencing tele-technology could be used to provide any aspect of Speech and Language Therapy. Of the 12 therapists who believed that there was potential to develop services using videoconferencing, the majority - 11 - worked independently. The NHS based therapists repeatedly observed that a lack of investment in computer equipment for current work activity would prohibit the trial and use of videoconferencing equipment to provide their Speech and Language Therapy service. From this questionnaire, it seemed that therapists who were independent were more likely to be working in a rural location and more interested in the potential use of tele-technology to provide their service.

The UK therapists expressed concerns not dissimilar to the American therapists; whilst none of the UK therapists had any experience using tele-technology to provide Speech and Language Therapy, they anticipated that there would be a loss of rapport with patients and a loss of contact with other key professionals. They also showed the same concerns that the technology would not be affordable and would be too complicated for either their patients or them to use with ease; 15 (50%) of the UK therapists thought that videoconferencing could reduce the pressure on their work and unlike the American therapists had no concern that providing a service using videoconferencing would infringe a patient's privacy. This survey, unlike the ASHA survey, specifically asked the therapists to rate the potential effectiveness of Speech and Language Therapy service delivered through videoconferencing. Perhaps, given that only 10% knew of any Speech and Language Therapy services provided using videoconferencing, the majority view – 88% - was that Speech and Language Therapy would be more effective when provided F2F.

The participant sample is small but the results do suggest that the UK therapists share the same concerns as the American therapists in ASHA's survey (2002). All the therapists completed the first part of the survey but not all completed the second part of the survey; the survey did not ask for reasons why the second part was not completed; although the survey was designed to take between 15 to 20 minutes to complete, there may have been uncertainty in completing a survey online which at that time was a novel approach and likely to be less familiar to the therapists.

Although the number of therapists involved in the UK survey was small, the UK based therapists shared concerns with their American counterparts that focused on professional issues, the loss of audio and visual acuity as well as using and managing the technology, the clinical issues surrounding the change of interaction and its impact on the therapeutic process, as well as costs to provide.

2.9 Conclusion

There is a simple and logical argument that advocates the use of tele-technology and specifically video-conferencing, to provide Speech and Language Therapy when it is a

service that is under resourced and heavily in demand. After thirty years of use there has been sufficient research to show that Speech and Language Therapy can be provided through tele-technology and yet its use to provide Speech and Language Therapy has remained limited. In setting up a therapy service that uses videoconferencing, it is necessary to minimise as many of the identified areas of therapist concern – professional, clinical, technological and budgetary. Not to do so runs the risk of investing in a service format that is not supported by the therapist work force.

2.9.1 Acceptability from the Therapist Perspective

The pressure to embrace new technologies will only increase with finite resources, budgetary limits and increased demand for Speech and Language Therapy services. Acceptance of tele-technology by other health professions to provide their service will provide additional pressure on Speech and Language Therapists to adopt it. With a generation of computer literate users growing up, there is an increasing population that has easy access and familiarity with computers (Moore and Primm, 2007). They are a generation that finds e-communicating as acceptable as F2F conversation. Familiarity with video-conferencing has been linked to client comfort and acceptance in other tele-health service applications (Eikelboom and Atlas, 2005; Spaulding, Davis and Patterson, 2008) and this suggests that barriers from within the Speech and Language Therapy profession to using video-conferencing technology need to be addressed if using video-conferencing is to become another way to deliver therapy services.

Review of the research suggests that tele-technology can be used to provide all three aspects of Speech and Language Therapy service to both adults and children with all types of communication need. Research has shown that clients were satisfied with therapy provided through tele-technology and none reported any negative feedback from clients about the technology, the therapy or the interaction and rapport with the therapist. Any negative feedback came from the therapists (Lemaire et al, 2001, Ward et al, 2007, Styles, 2008) and their concerns focused on the session management, managing the technology, feeling uncomfortable talking about intimate patient

concerns, under more pressure in the session (Styles, 2008) and concerned to achieve an identical therapy format to the F2F session (Lemaire et al, 2001, Ward et al, 2007).

The development of therapy services using tele-technology would seem to be limited by the reservations of the therapists themselves, despite a succession of studies reporting positive research outcomes. The barriers in the ASHA survey (2002) had identified therapist concerns that were not based on experience as only 15% of the therapists who participated in that survey had actual experience of using tele-technology to provide any aspect of their service. These barriers included purchase cost of equipment, reimbursement, no professional guidance, ethical issues around confidentiality and malpractice, change of work practice, training to use and manage the technology, concerns about amount of clinical activity and changes in interaction and consequent loss of rapport. These barriers, largely professional, were addressed by ASHA's professional guidelines published in 2005.

Acceptability from the therapist perspective would be shown if the Speech and Language Therapy sessions provided using tele-technology were equivalent to the F2F sessions i.e. adequate and good enough to achieve the same level of therapy activity. The barriers in the ASHA service have been reiterated in later reviews of Speech and Language Therapy services using tele-technology (Mashima & Doarn, 2008, Hill & Theodoros, 2002). Acceptability for the users (children) and purchasers (parents) would be different to the therapist but if the children and parents consider the therapy sessions using tele-technology to be acceptable, this would contribute to the use of tele-technology being acceptable to the therapist; a key component for any health service whatever its form and whoever the provider has to be client acceptability.

On-going improvements in the design of the technology and its increased affordability, have addressed some of the therapists' reservations over using tele-technology to provide therapy. For those based in America and Canada, their national professional organisations – ASHA and CASLPA - have established professional guidelines. This leaves four remaining reservations that include achieving equivalent work activity, managing the tele-technology, rapport and interaction and establishing the costs of

providing a service using tele-technology. This research set up a service using video-conferencing to investigate four of these remaining reservations – first, clinical activity, second, the technology, third, the interaction and finally the costs to provide.

Chapter 3 Designing a Speech and Language Therapy Service Delivered using Skype

This chapter first describes an established Speech and Language Therapy practice and second how this Speech and Language Therapy practice developed a service that used tele-technology, specifically Skype, using the experience and identified therapist concerns from previous research projects. The Speech and Language Therapy service undertaking this research is an independent, not for profit practice and provides Speech and Language Therapy for children between the ages of 3 and 18 years of age.

3.1 Location

This Speech and Language Therapy service has no central clinic base and is instead based in the therapist's home where the administration function of the service is accommodated complying with the necessary, relevant legal requirements. With no clinical base, the therapist provides a peripatetic Speech and Language Therapy service working with the children in the location most suited or most convenient for them. This could be either their home or educational establishment.

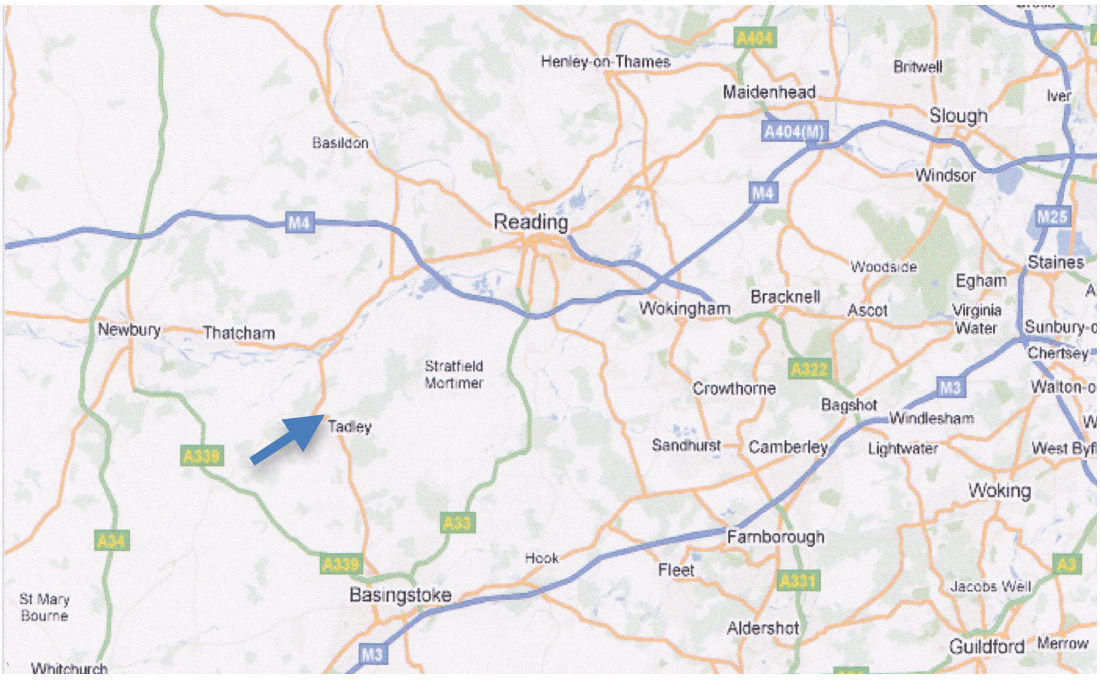

Figure 1: Map of area covered by research practice (Scale = 10km/4cm or 5 miles/an inch)

The therapist providing the service is able to cover a wide geographical area that reaches as far as Slough including Maidenhead and Reading, over to Newbury as well as south to Basingstoke, Fleet, and Bracknell (Figure 1). The maximum one-way journey travelled is 30 miles.

The distance travelled in a day is minimized so that the therapist expects to travel a minimum of 25 miles but no more than 100 miles in a day. The area is well served with two motorways and a network of main roads. However, with London less than 50 miles from the practice base there is often congestion on the roads that increases the time that has to be allowed for travelling between destinations.

3.2 Caseload

The majority of referrals to the service come directly from the families; 23% to 46% of referrals are made by Local Education Authorities (LEAs) purchasing Speech and Language Therapy to meet their legal obligations for pupils with a statement Special of Educational Need (SEN).

3.2.1 Age

The service provides Speech and Language Therapy for children aged from 2 – 18 years. In 2005, the practice caseload totalled 42 children of which 44% were junior school age (8 - 11); 21% attended Infant School (4 - 7) and 21% attended secondary school. Fourteen percent were 3 years or younger.

In 2010 the practice caseload had reduced to 35, with 54% of the children junior school age, 23% Infant school age, 11.5% Secondary school age and the remaining 11.5% preschool age.

3.2.2 Medical Aetiologies

The children present with a wide range of different medical aetiologies that fall into five distinct groupings; physical conditions such as cleft lip and palate; sensory loss that includes both chronic long term hearing loss and acute hearing loss conditions such as otitis media (glue ear); specific syndromes that affect a child's cognitive, intellectual, sensory and social development such as Autism, Autistic Spectrum Disorder (ASD) and Asperger's Syndromes along with Attention Deficit Hyperactivity Disorder (ADHD), Dyspraxia and less well known syndromes such as Atypical William's Syndrome and Klinefelters Syndrome; congenital non progressive motor disorders associated with sensory and behavioural disabilities such as cerebral palsy; and children with no specific medical diagnosis.

Table 7 shows the medical aetiologies of the children recorded by this practice caseload in 2005 alongside those recorded in 2010. The largest group – developmental - in both 2005 and 2010 had doubled in five years. Although this Speech and Language Therapy service has a small caseload, the children continue to present with a wide spread of aetiologies.

Aetiology Group	% of Caseload 2005	% of Caseload 2010
1. Physical	12%	1%
2. Sensory	None	4%
3. Developmental	40.5%	71%
4. Neurological	9.5%	1%
5 No specific diagnosis	38%	23%

Table 7: Range in Speech and Language Therapy Service Caseload Medical Aetiologies in 2005 and 2010

3.2.3 Communication Impairments Treated

Just as there is a spread of medical aetiologies amongst the children there is a wide range of communication impairments. As many speech and language impairments can co-exist, children have not been excluded from this Speech and Language Therapy service unless their communication impairment is specifically and discretely identified as solely a fluency or vocal fold problem. The majority of the children at any time have more than one communication impairment. In many instances one communication

impairment can impact on another - a child with a phonological impairment may also have an expressive language impairment.

The range of communication impairments covered falls into four main groups; 1) sounds: which includes articulation and phonology; 2) expressive language: including word learning and finding as well as syntax; 3) receptive language: including conceptual vocabulary, understanding of specific forms of syntax, attention, memory and listening skills; 4) pragmatic language skills: including the ability to integrate verbal, visual and prosodic information as well as organise verbal information for different listeners, situations and purposes.

3.3 Speech and Language Therapy Intervention Offered

The intervention offered is designed to suit the specific needs of the individual child alongside the logistic issues of scheduling the appointments at convenient timings for them combined with manageable travelling between locations for the therapist. Consequently some children may have regular weekly appointments whilst others have an appointment every month and others have a series of weekly appointments periodically. Some of the children attend appointments with this practice in addition to NHS Speech and Language Therapy appointments.

The sessions are scheduled for either an hour or thirty minutes and based wherever is most suitable for the child. It has been an important principle for this Speech and Language Therapy practice that working in the child's home environment is the most suitable setting to engage the child and their family and so effect change (Hanft and Pilkington, 2000). There is evidence to suggest that a child when assessed in their home environment will achieve higher language scores on formal tests (Kramer, James and Saxman, 1979) so that working with a child in a clinical environment inhibits their language performance. Working in a health centre, whilst convenient for the therapist, is not necessarily the most suitable venue for Speech and Language Therapy sessions.

Within a session, whether thirty or sixty minutes long, the activities are selected to focus on the child's identified difficulties and in keeping with Dr Roy McConkey's approach (1985). McConkey advocates the use of games to practice and learn skills for language; the majority of the materials used in the F2F Speech and Language Therapy sessions are commercially available games adapted for use in Speech and Language Therapy sessions along with materials specifically designed for Speech and Language Therapy such as computer games and work sheet activities. Time is allocated at the end of the session for liaison to first, write a session summary and second, provide guidance on what either the family or school could do to reinforce the skills being developed in the therapy session. (Stevenson et al, 1982; Manolson, 1992; Baskett et al, 1999; Ward, 1999)

3.4 Practice Activity

Delivering the therapy sessions involves a wide range of work activity that falls into two groups. The first group comprises activities that can be linked directly to the client; these include travelling, preparation of materials, packing and unpacking the equipment in and out of the car, administration and liaison that includes note taking and report writing and is typically referred to as clinical activity. The second group is activity that is not directly linked to any client but is necessary; activity includes professional development as well as business/practice management and is usually referred to as practice administration.

In 2006 a week long record of this practice's activity showed that in a 56 hour working week, 84% of the work time was activity that could be classified as clinical activity. Figure 2 shows the ratio of work activity recorded.

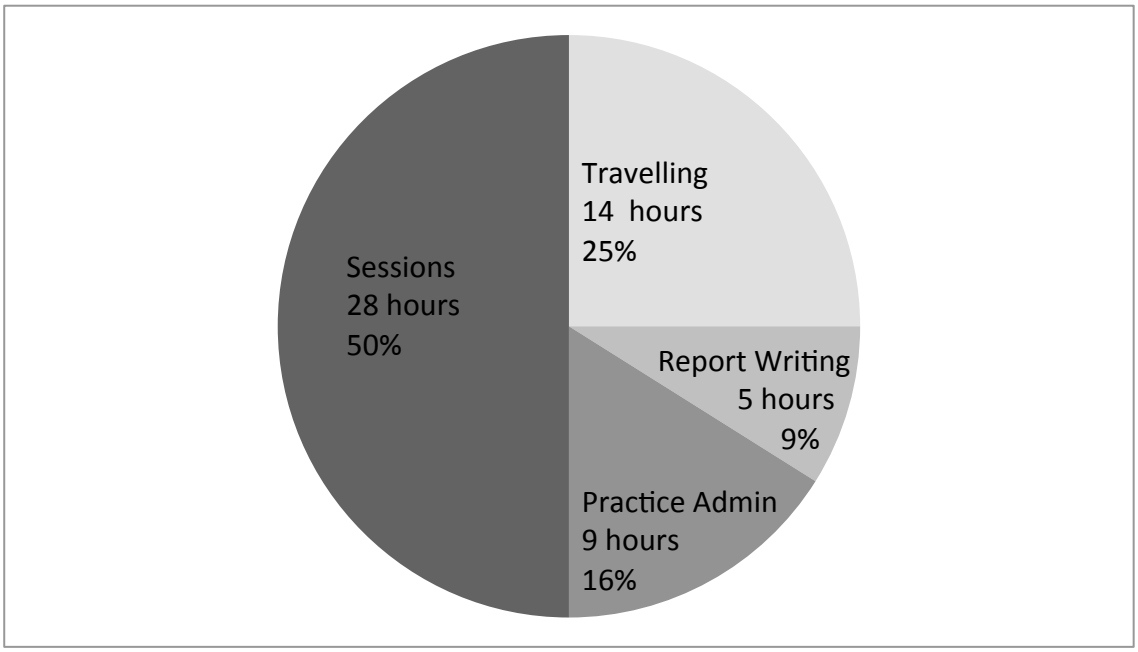

Figure 2: Practice Work Activity in a 56 hour Working Week

The majority of the work activity - 50% of the whole week work time - was spent in actual sessions and preparation of materials, writing up case notes and F2F liaison; the other substantial part of the working week - 25% of the 56 hour week - was spent in travelling; 9% of the whole working week was spent report writing and planning sessions for the following week. Just 16% of time was spent on practice administration.

The range of activity recorded is not dissimilar to that reported in the work activity survey (Matthews, 2009). However, one substantial difference was observed – the travelling reported by the majority of those completing the survey was less than five hours in a week whilst this practice recorded travelling time of 14 hours in that specific week which equalled half of the clinical face-to-face time.

3.5 Practice Improvement

Evaluation of this small survey indicated that reducing the travelling time could increase the available time for Speech and Language Therapy sessions – either to raise the quality of liaison and report writing activity or to increase the number of children that this Speech and Language Therapy service could support. The most immediate way to achieve a reduction in travelling time would be to identify a central base from

where to run sessions. Whilst this would increase the available time for clinical work, it would mean that the children would not be in the most suitable environment for Speech and Language Therapy (Kramer et al, 1979, Hauft and Pilkington, 2000) and their families would have to bear the costs and inconvenience of travelling to the therapist; travelling to a central point might be too disruptive or impractical and not suited to the child (Hauft and Pilkington, 2000). For those children with a statement of SEN funded by their LEA, such an arrangement would not be acceptable in any case

An alternative which would reduce the therapist's travelling time, and expand the time for clinical activity, while still allowing the child still to attend sessions in their preferred location without incurring costs or inconvenience would be the use of tele-technology - specifically a video-conferencing link using desk-top video-conferencing.

3.6 Issues to address for a Speech and Language Therapy Service using videoconferencing

The anecdotal experience and formal research of other therapists using video-conferencing as well as ASHA survey (2002) findings and their subsequent guidelines for practice (2005) provided valuable guidance in setting up a new Speech and Language Therapy service provided through video-conferencing. This guidance addressed four areas – professional, tele-technology, clinical and cost.

3.6.1 Professional Issues

The American Speech Hearing Association (ASHA) established in their survey (2002) that there were a number of concerns or barriers that limited the use and take up of videoconferencing to provide Speech and Language Therapy service, even though 717 of the 1,667 ASHA members answering the survey expressed interest in using tele-technology including videoconferencing.

Their concerns included lack of professional standards, potential malpractice liability, patient confidentiality and licensure laws that would affect interstate practice. This last professional concern is specific to the USA where therapists are registered to work specifically within a State and not beyond the boundary of that State – accessing

therapists beyond a State boundary becomes practicable if using a tele-technology link and there is no need for either party to travel.

The concerns raised in ASHA's Survey (2002) were addressed in ASHA's Technical Report produced in 2005. The ASHA Technical Report established guidelines on the use of all tele-technology including video-conferencing. These guidelines reiterated the need for the same standards as when working F2F and established three principles: to consider the welfare of the patient the main priority; to provide all services competently, and to maintain the same standard of practice when providing Speech and Language Therapy through tele-technology as F2F.

The ASHA Technical Report listed the following additional professional practice guidelines for Speech and Language Therapy services delivered through tele-technology:

1. Therapist to be educated and trained in models of tele-practice delivery
2. Therapist to inform patients on how sessions through videoconferencing could differ from F2F sessions
3. Therapist to create a safe environment to provide service
4. Therapist or Speech and Language Therapy service to provide training and support for patient and their family to ensure quality of service delivery
5. Transmission and storage of electronic health information to conform with state regulations
6. Therapist only to provide Speech and Language Therapy service where they are registered to practice which coincides with the location of the patient accessing the Speech and Language Therapy service.

No equivalent guidance on the use of tele-technology has been produced by the RCSLT, so the three principles in ASHA's Technical Report along with the additional guidelines were adopted for the purpose of this study.

3.6.2 Tele-Technology Issues

The majority of Speech and Language Therapy services using videoconferencing to provide their service remotely have used dedicated systems that have relied on the therapist being in a specific health establishment with clients obliged to travel to a health establishment to make the video link through a compatible system (Kully, 2000, Scheidemen-Miller and Clark, 2000, Lalor et al, 2000, Lemaire et al, 2001, Perlman and Witthawaskul, 2002, Theodoros et al, 2003, Baron et al, 2005, Pierrakeas et al, 2005, Ward et al, 2007, Howell et al, 2007, Styles, 2008, Theodoros et al, 2008); whilst therapists may have attended dedicated training sessions to be able to operate the system, these services have still relied on engineers and other staff being available to maintain the video link in a session (D. Randall, personal conversation, 2008). This static, inflexible, complex and costly approach needed to be addressed if this Speech and Language Therapy service was to work successfully using tele-technology.

3.6.2.1 Video-conferencing Systems

From the research, four criteria for selecting a videoconferencing system to provide Speech and Language Therapy were identified. The system needed to be one that could be used in the child's location, school or home; simple to use, not needing on-hand engineering support; requiring little or no additional equipment; with minimal or no cost to the client. One system was identified that met these criteria.

The Skype system was selected because it has an established reputation. It is a system that can be downloaded onto any computer system – PC or AppleMac - so consequently be located wherever the child might be; it is well–established and used by the general public world-wide and has consequently been designed to be simple and easy to use with online support and many user friendly guides available; it can use the increasingly common built-in web cameras and microphones found in many computers. Even without a built in web camera, little additional peripheral equipment is required – modestly priced web cameras and headphones are readily available from any electronics high street retailer modestly priced. Finally, the Skype software is free

to download and calls from one Skype caller to another can be made at no charge (http://www.skype.com/en/what-is-skype/).

3.6.2.2 Protocols

The need for protocols to manage a remote conversation has already been identified (Styles, 2008; Miller, 2011). At UCL Medical School a list of parameters to manage both the environment and interaction have been specified (Gill, Parker and Richardson, 2005) and are set out in Table 8.

	Aspect	Problem	Solution
1	Lighting	Side lighting creates shadow	*Cut out daylight and use overhead lighting*
2	Position	Seeing speaker and teaching materials	*Check what shows in the view for remote end* *Identify materials necessary for remote end*
3	Audio	Feedback and echo	*Consider using headphones* *Adjust rate of speaking*
4	Visual	Clothing potentially distracting	*Wear clothing which is plain to limit distraction*
5	Materials	Visual material too detailed	*Use simpler visual material* *Ensure remote end has visual materials*
6	Attention	Attention at remote end lost	*Involve students in an activity to keep them focused periodically e.g. quiz*
7	Eye Gaze	Eye gaze can seem odd to remote end	*Place a small toy on camera to direct eye gaze to remote end and not the screen*
8	Breaks in Video link	Break in the link can disrupt	*Understand how to operate the technology* *Notes for lecture sent to remote end in advance* *Identify a way for remote end to get a break* *Nominate a spokesman for remote end*
9	Managing Interaction	Whose turn to speak	*Identify a system – hand up, alternate between remote and lecturer end*
10	Style of Talking	Distortion to what is heard and seen at the remote end	*Minimize jargon* *Keep gestures necessary* *Keep to the point* *Use a slower measured rate of speech*

Table 8: Parameters to manage the environment and interaction when video - conferencing

Some of these management issues related to the use of the fixed video-conferencing technology that the UCL Medical School used. Other issues related to the nature of lecturing or the numbers involved - speaking with a group of students at the remote end rather than to an individual or managing a group of students in the same space as the lecturer as well as those at a remote lecture hall. Whilst their overview raised a

number of management issues specific to a highly complex videoconferencing system and a very different communication context, it nevertheless provided parameters to consider in the one-to-one context of therapy provided through a desktop videoconferencing system.

3.6.2.3 Training

Using both the anecdotal experience of other Speech and Language Therapists (K Montgomery, personal communication, 2008; D Randall, personal communication, 2008) and other services (Gill et al, 2005) along with the professional guidelines set out by ASHA in their technical report (2005), a training protocol was developed to make the management of the Skype sessions easier from setting up the videoconferencing system, to managing the call. This included instructions to download the Skype programme, equipment set up checklist, Skype administration details and contact details for the therapist, session preparation checklist, troubleshooting tips and protocol to manage a loss of connection. The complete Training Manual can be seen in Appendix 2.

3.6.3 Clinical Issues

ASHA Technical Report also provided guidance in addressing issues linked to clinical practice. These issues were patient suitability to benefit from Speech and Language Therapy service delivered through videoconferencing, the session format, range of activity, and equipment and materials to be used in Speech and Language Therapy sessions provided through videoconferencing.

3.6.3.1 Patient Suitability

The client suitability list is not exclusive nor is the list weighted in any way to determine which factors need extra consideration within different clinical settings and with different clinical patient groups.

To ensure that families were not approached inappropriately to work through Skype, the fourteen 'suitability' factors identified by ASHA were used to form a checklist of twelve points that can be seen in Table 9. The factors in the suitability checklist were useful to plan that particular child's Skype Speech and Language Therapy sessions.

	Factor	Issue YES/NO
1	Necessary computer and peripheral equipment available *Includes printer for material preparation* *Email account for communication*	
2	Support for technology available *Includes adult support in session if that is necessary to manipulate compu*ter	
3	Physical endurance *Seating requirements, Learning breaks necessary, Session length affected*	
4	Distractibility *Affected by hearing, visual information, touch - wearing headphones*	
5	Hearing acuity *Any issues with hearing that might affect headphone use*	
6	Visual Skill *Able to see therapist end and materials, other adaptations needed*	
7	Literacy Level *Will this affect materials sent to child's end, ability to read the board at therapist's end*	
8	Cultural considerations to accommodate *Scheduling of appointments/computer use/language barriers*	
9	Speech Intelligibility *Affect therapist following instruction from child/connection best possible*	
10	Verbal Comprehension *Level of difficulty, materials suitable to use on Skype*	
11	Memory *Need for more support at child's end or material adaptations*	
12	Issues with Face-to-Face Speech and Language Therapy sessions *Includes timing, attendance, compliance*	

Table 9: Skype Speech and Language Therapy client suitability checklist

3.6.3.2 Session Format

In ASHA's survey (2002), therapists' second most popular reason to favour F2F over tele-technology to provide Speech and Language Therapy service was the loss of 'human connection' and a perception that tele-technology would be detrimental to the quality of interaction between the therapist and the client.

Concerned not to pit the F2F session format against the video-conferencing session format, it seemed sensible to provide both F2F and Skype therapy sessions for each

client. The number of F2F and video-conferencing sessions would be determined through mutual agreement between the family and the therapist just as the frequency of sessions is already determined by mutual agreement.

3.6.3.3 Clinical Administration of Sessions

There are professional protocols to ensure that client case notes are maintained in a timely way (RCSLT, 2009); these protocols are standard for any health professional working with any client group and in any setting. This Speech and Language Therapy practice is to write up a session plan at the end of every session; this is copied automatically to the family and the therapist and where appropriate to the child's school/nursery. The planned activity is typed and the report written at the time of the actual session is handwritten and signed. An example of a typical session plan can be seen in Appendix 3.

The session plan is an important part of the clinical activity, providing an opportunity for liaison as well as forming the case notes. Working through Skype would mean that the immediacy of the session plan summary feedback would be lost. Therefore it was arranged that session plan summaries would be sent as email attachments to the child's family after they had been written up following the actual Skype therapy session. To ensure that email correspondence that related to clinical activity was not confused with other email traffic an additional email account was opened.

3.6.3.4 Clinical Equipment

Many of the services using tele-technology to provide therapy have used specific formatted therapy programmes such as the Lee Silverman Voice Treatment (LSVT) used with dysarthric speakers and the Lidcombe Program or the Camperdown Program used with dysfluent speakers. The LSVT programme requires frequent but short fifteen-minute practice sessions that focus on a prescribed hierarchy of exercises. The Lidcombe and Camperdown Programs use reading and conversation as practice materials and focus on a specific individual attribute of fluent speech which are gradually combined with others through practice; like LSVT, the client using the

Lidcombe and Camperdown Program, is following a prescribed format for specific exercises to practice that do not use aids or complicated materials.

Restricting therapy to specific formatted programmes is not typical of the Speech and Language Therapy offered to patients accessing this specific Speech and Language Therapy practice. Not using specified therapeutic programmes reliant on a set range of standardised materials raised the need to adapt the wide-ranging materials used by this Speech and Language Therapy service. None of the published studies of tele-technology use by Speech and Language Therapy services describe what equipment they used to provide therapy activity in the Speech and Language Therapy sessions. It was considered important to ensure the same range of materials were used in the Skype and F2F Speech and Language Therapy sessions to achieve a more accurate comparison of the acceptability of both materials and work activity.

Having adapted materials to use in these videoconferencing sessions, it would be necessary to consider how these materials could be organised for the child at the remote end. This required the therapist to have both an administrative and equipment infrastructure that enabled smooth and easy handling of the materials as if working F2F with the child.

Another important part of the regular F2F Speech and Language Therapy sessions is the reward at the end of the session - typically a sticker but in some instances a sweet. Clearly to be acceptable to the children there was a need to develop an equivalent system of reward for the Skype sessions.

3.6.3.4.1 Equipment Adaptation

The USERfit Tool is a system developed with European Community (EU) funding to adapt equipment or invent solutions for the physically disabled and can be downloaded directly from the website http://sc.ehu.es/acwusfit. Whilst USERfit focused on immediate and practical activities such as opening doors and turning on taps, it provided a systematic approach for managing the adaptation of therapeutic materials from use in a F2F setting to a video-conferencing context.

Each activity or material went through six stages in the USERfit process. In the first stage each activity was listed; in the second stage described in full; and in the third stage the use specified; in the fourth stage the sensory skills needed to use the material were plotted out on a grid. An example for Mastermind™ is shown in Figure 3, with explanatory comments; in the fifth stage, possible adaptations were specified and then created – this included enlarging materials, laminating, reproducing on magic whiteboard sheets, magnetizing materials to use on a vertical board, scanning materials into the computer for copying to the children as and when required, downloading audio tapes onto an iPod along with cataloguing all the materials for easy retrieval. In the final stage the materials were trialled and modifications made before being considered ready for use in the Skype sessions using.

Clinical Material			Mastermind (Victory toys)
	Skill Required	Yes/No	Comment + Adaptation Considerations
1	Visual	Yes	To see board and identify coloured playing pieces, process location of playing pieces and also the black and white feedback counters Size of magnets/Size of board at therapist end/background colours
2	Hearing	Yes	To process the feedback and any other verbal information
3	Tactile	Yes	Fine motor skills to organize playing pieces to work out the code or provide feedback using black and white counters Numbers on board at therapist end would provide support for instructions from child to therapist/reminder card on available colours for child at their end of link
4	Smell	No	No action
5	Taste	No	No action

Figure 3: Grid for the Fourth Stage of the USERfit Process

Activities requiring the child to use their sense of smell and taste could not be adapted for use in the Skype Speech and Language Therapy sessions. Specifying the use of the material for the purposes of Speech and Language Therapy determined which activity materials could be adapted without losing their value in the therapy process. In some instances the adaptation added to the value of the material for therapy; for example, many of the activities required tactile skills to move playing pieces/cards as the child processed information; adaptation was considered possible for many of these activities because the child could instruct the therapist to move individual parts so increasing the value of the material in the Speech and Language Therapy process by

providing an opportunity for the child to give an instruction as well as an opportunity to practice processing information.

3.6.3.4.2 Equipment Management

The activities fell into two groups - the first required some part of the activity to be sent to the child in advance whilst the second did not require any advance preparation.

Before Session	Day of Session = before session	Day of Session = after session
Email sent with materials to prepare for next Skype session	Family prepares for session	Session plan summary written up along with certificate
Email sent to remind family on timing of Skype session	Therapist checks session plan and gathers necessary materials	Email sent with session plan summary with child's reward certificate
Therapist prepares activities needed for child's session plan	SESSION	Therapist prepares next Speech and Language Therapy session plan

Figure 4: Sequence of email events to prepare and conclude a Skype therapy session

Activities that needed advance preparation were stored on an external hard drive so that they could be accessed from more than just one computer terminal; activities were grouped on this external hard drive according to their Speech and Language Therapy purpose. A protocol was developed to prepare families for each session and is shown in Figure 4.

3.6.3.4.3 Infra Structure

As there was a wide range of materials adapted from F2F use to Skype use, it was necessary to have a system to access them with ease in a session. The materials needed also to be presented so that the child at the remote end could see them. As many of the materials used moving pieces there needed to be an independent way to present the activity and still be able to manipulate the parts of the activity as necessary.

The solution was a magnetic board placed three feet directly in front of the computer and its integrated webcam. Different sizes of magnets were used as well as magnetic tape. A moveable storage tray with white top surface was used to store necessary parts but was also small enough to be moved as required in front of the webcam and to provide an extra surface for the materials during a session. Figure 5 shows the key pieces of furniture that provided the necessary material infra structure.

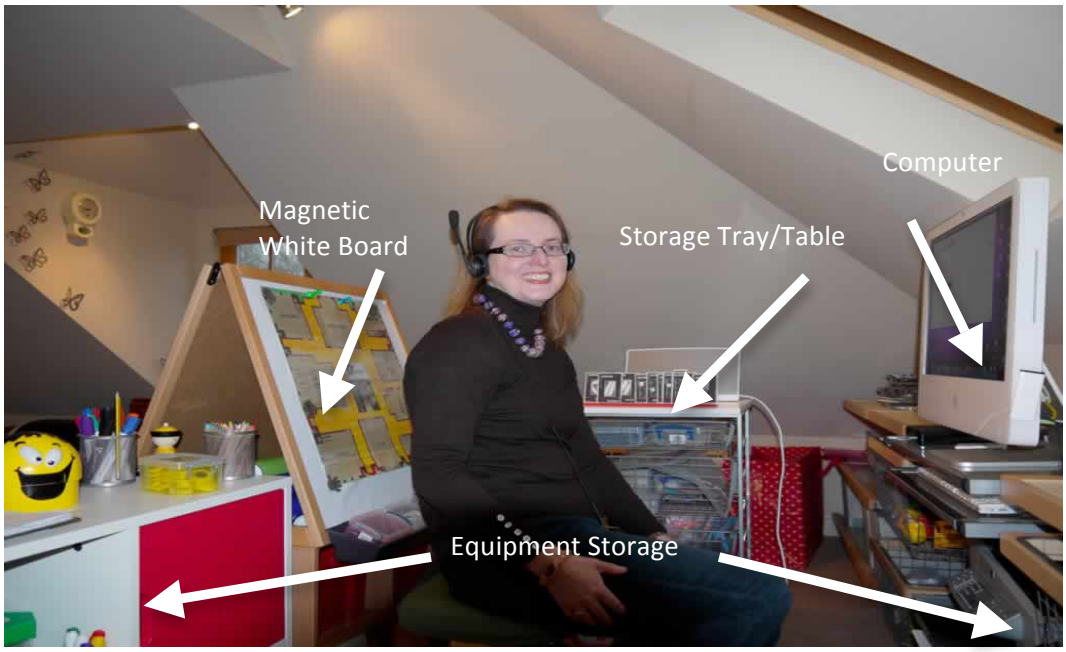

Figure 5: Layout of Skype Session Equipment

3.6.3.4.4 Reward Adaptation

Rewards, both verbal and material i.e. a sticker, are an important feature of the F2F sessions and to ensure equity and acceptability, it was necessary to provide a material reward when the sessions were provided through Skype. This led to developing a certificate master on the computer, formatted to take various clip art illustrations. Unlike the standard stickers, the words on the certificate referred to the child's actual performance in that specific session and were not generic as on a standard sticker. Examples of the certificate can be seen in Appendix 4.

3.6.4 Cost Issues

Introducing a new service delivery format using tele-technology necessarily involved costs to set up – the tele-technology equipment for the therapist and patient, clinical equipment and determining what fee could be charged.

3.6.4.1 Tele-technology Equipment

The cost of equipment was a barrier for 14% of those participating in ASHA survey (2002) to develop tele-technological Speech and Language Therapy services. The cost for a single ICAN Teach Speech videoconferencing unit was approximately between £15K and £20K in 1997 (Katsavarus, 2001); the units consisted of a large screen and all the necessary ISDN cabling and once fixed in a specific agreed location could not be moved without the direction of telecommunication engineers. Whilst the costs have reduced in the time since the Teach Speech Service was trialled, the best quality multiple ISDN connected units still remain expensive to purchase and also incur additional running and maintenance charges (D. Randall personal communication, 2008).

Using a low-cost desk-top video-conferencing system such as Skype would not only address the need to keep the technological skill and demands on the therapist and the families to a minimum but also make the service affordable and so more attractive to families. Most families and all schools have ready access to a computer with internet access and a broadband connection.

Using a desktop videoconferencing system meant that unlike the ICAN Teach Speech Service, no additional equipment purchase would be necessary nor would there be any installation costs for downloading the free Skype programme. The peripheral equipment that was identified as necessary comprised two Skype compatible headsets and a Y splitter to allow both the child and adult at the remote end to hear the therapist. The headphones were necessary to minimise the echo and other feedback noise; for those with older computers not fitted with an integral web camera it was also necessary to purchase a Skype compatible web camera. Included for all the

children was a small bendy character that could be attached to the web cam to keep the child's focus on the camera (Gill et al, 2005). The peripheral equipment was provided by the Speech and Language Therapy service to reduce the burden of cost on the patient and their family and to limit the likelihood of failure or reduced quality in audio and visual clarity because the peripheral equipment was incompatible with Skype.

3.6.4.2 Clinical Materials Management

Three groups of associated costs in adapting the clinical materials for use in the videoconferencing sessions were borne by the Speech and Language Therapy service. These comprised the therapist's time to make the adaptations, the cost of products to make the adapted materials such as laminate, paper, magic whiteboard, various sizes of magnets and paper along with the cost of equipment to store and manage the clinical materials i.e. storage furniture, external hard drive, mobile whiteboard, window blinds and adjustable lighting.

3.6.4.3 Session Charges

In ASHA's survey (2002) a number of therapists raised the issue of non-reimbursement. This is a key issue in the USA where healthcare is funded through health insurance companies. By 2005 when ASHA's Technical Report was published there was a suggestion that reimbursement from health insurance companies for tele-technology sessions had increased as these services developed and became better understood and accepted as equivalent to F2F therapy sessions. It was, however, still considered to be a potential barrier to developing tele-technology Speech and Language Therapy services in the States and can only be resolved as the efficacy and benefits and not just feasibility are shown with research.

Reimbursement in the UK for non NHS Speech and Language Therapy services is typically directly with a client or an organization that has commissioned the Speech and Language Therapy service such as an LEA. It is therefore more direct and easier to establish that payment would be made for sessions provided using Skype. However,

given that the benefits and acceptability of using desktop videoconferencing were to be assessed in this study, it was felt appropriate that participants in the research trial would be charged a reduced fee for both their F2F and Skype sessions.

The amount and period of session fee reduction was clarified in the participant invitation letter. Table 10 sets out the charges for the F2F and Skype sessions.

Session Length	F2F session charge	Skype session charge
60 minutes	£60	£50
30 minutes	£40	£30

Table 10: F2F and Skype session charges

3.7 Conclusion

The published and personal experience of other therapists was used to develop this Skype Speech and Language Therapy service and address the concerns of therapist raised in ASHA survey (2002). The Skype Speech and Language Therapy service developed for this research was flexible, using the easy to manage Skype system, with affordable peripheral equipment, with clear management and administration processes in place and a training protocol established.

Chapter 4 Methods

This chapter will describe the methodology used in the thesis. First the aspects of acceptability to be investigated and an overview of the measures used; second a summary of the pilot study; third, an outline of the participant recruitment process, the inclusion and exclusion criteria used and a description of the thirteen participant families approached; fourth, description of the four measures and how they were developed and finally an outline of the procedure for the main study.

4.1 Research Design

Four concerns of Speech and Language Therapists focused on the acceptability of a Skype-based service had been identified in previous research (ASHA, 2002). These concerns were: 1) working remotely i.e. using video-conferencing, would lead to a reduction of clinical effectiveness because the range and number of activities that could be completed would be reduced; 2) the use of video-conferencing technology could disrupt the session and this could include the amount of clinical activity and also the interaction between the therapist and the patient; 3) change in the interaction between the therapist and patient would interfere with rapport between the patient and therapist and consequently the therapy process; and 4) the costs to provide Speech and Language Therapy using video-conferencing would be more expensive than face to face (F2F) sessions. The current study therefore was designed to examine each of these issues.

Most earlier studies concerned with the acceptability of using video-conferencing have used independent measures such as questionnaire/interview (Katsavarus, 2001, Lemaire et al, 2001, Howell et al, 2007, Ward et al, 2007, Styles, 2008, Theodoros et al, 2008, Tindall et al, 2008, Carey et al, 2010, Grogan-Johnson et al, 2010, Constantinescu et a, 2010, Hein Ciccia et al, 2011) or session report card (Sicotte et al, 2003) with matched samples, providing Speech and Language Therapy for a participant either F2F or through a video-conferencing format, and collecting a single strand of data e.g. voice amplification measure after a series of sessions using a specific standardised

therapy programme (Howell et al, 2007, Tindall et al, 2008, Constantinescu et al, 2010), or a perceptual rating of fluency (Kully, 2000,Sicotte et al, 2003, Carey et al, 2010). Such research has the benefit of being well controlled but can be limited by recruiting participants to a specific group based on their access to a computer (Howell et al, 2007) or bias because of their limited experience of Speech and Language Therapy prior to experiencing a remotely delivered service (Styles, 2008). Unlike previous research, the present research project used a repeated measures design to enable direct comparison of different modes of delivery (F2F and Skype) to the same participant. By using the same group of participants, individual differences between participants or therapists were limited as a potential confounding variable, and fewer participants were required. Experiencing both session formats also enabled direct comparison of the interaction, with the session format as the independent variable. Furthermore, each child experienced multiple speech and language therapy sessions in each format (10 for each child) allowing for variation across the data set to be evaluated.

Given the complex nature of speech and language therapy interventions, rather than examining a single aspect of intervention, which has been a limiting factor in prior research, the current study adopted an approach incorporating four key elements of data collection that address the four key concerns outlined in the 2002 ASHA survey. The analysis of *clinical activity* in each format of delivery was addressed by documenting the number of goals completed and type of activities, and through the adult questionnaire and child interview. Issues related to the *functioning of the technology* were recorded via a measure of interruptions caused by technical difficulties, and the audio and visual quality, which was rated, by the therapist and the children receiving intervention after each therapy session. A significant area of concern relating to potential disturbance to the *therapist-child rapport* was explored in the current thesis by a detailed quantitative analysis of video recorded therapist-child interactions in both session formats along with the level of child 'involvement' in the sessions (involvement was defined as the child's participation and level of anxiety). An examination of the comparative cost of Skype and F2F intervention was also carried out based on thorough documentation of the therapist's work activity. A description

of research measures developed to capture these data is provided in section 4.4 below.

4.2 Pilot Study

Before undertaking the project, a pilot study was set up with two aims. The first was to trial the Speech and Language Therapy Service using Skype; this covered setting up the technology between the therapist and the child wherever they might be located i.e. at their home or their school; managing the technology during a Skype session period both at the therapist and remote end of the connection; and trialling the adapted activities along with the administrative procedures. The second aim of the pilot was to trial the data collection and data analysis methods designed to address the four areas of therapist concern identified in the ASHA survey (2001) – clinical activity, technology, interaction and cost.

Application was made to the UCL Graduate School Ethics Committee, following their standard procedures for ethical approval. No amendments were requested and permission for the pilot study was given in July 2008 for one year. The outline of the proposed study from the application to the UCL Ethics Committee can be seen in Appendix 5. In July 2009 the request for an extension to the research was made and permission was given. The key amendments in this request to extend ethical approval are set out in Appendix 6.

Three families with children already referred to the researcher were recruited to participate in the pilot. Their involvement in the pilot was discussed informally, F2F or on the phone/Skype, before they were sent the pilot study invitation letter that confirmed the outline of the pilot study and how it would involve them and their child as well as an explanation of the session fee structure. Attached to the invitation letter was a consent form that they were asked to complete.

The three children in the pilot were also sent an invitation letter to explain how the Speech and Language Therapy sessions on Skype would work and what they would be asked to do for the pilot study. All three participants in the pilot study were male, had

a diagnosis of autism or Autistic Spectrum Disorder (ASD), were secondary school age and had a statement of Special Educational Need (SEN). Two of the pilot participants, PS1 and PS2, were new referrals to the research practice and both lived beyond the usual commuting range of the research therapist

A total of 23 Skype sessions were scheduled for the pilot study participants. One of the three participants, PS3, did not continue with the Skype Speech and Language Therapy sessions after his preliminary Skype session trial although he did continue with F2F sessions; no data were collected from PS3.

PS1 attended for a total of 8 sessions using Skype. These were with his personal tutor and at her home generally in the early evening; PS1 had three to four one-to-one tutor sessions in a week. He attended 3 sessions F2F in the pilot study trial at the therapist's base with his mother and personal tutor present on each occasion; these sessions were scheduled during school holidays or at the weekends outside of the usual school routine. The combination of F2F and Skype sessions established a session once every three weeks; each session was scheduled to last for an hour although the F2F sessions lasted longer – up to two hours - with discussion about activities that the tutor could continue and also discussing their liaison with their Local Education Authority (LEA).

PS2 attended a total of 14 Skype Speech and Language Therapy sessions. Only the first session with PS2 was F2F; this was informal because PS2 was unwell; the family did not ask for further F2F sessions after the Skype sessions were underway. PS2's attendance was often erratic with sessions cancelled in order that he could attend various hospital appointments or because he was unwell. His sessions were scheduled weekly each lasting an hour.

The pilot study confirmed that setting up and providing a Speech and Language Therapy service through Skype could be successful; problems identified during the pilot study were addressed directly at the time and incorporated into the design of the main study. A notable outcome of the pilot work concerned feedback provided by the participants and their families and led to a number of amendments to the parent invitation letter (Appendix 7) and to the consent form so that participants could

indicate parts of the data collection process that they did not want to be involved with; the amended consent form can be seen in Appendix 8. The new invitation format included a summary leaflet which provided a fuller explanation of the purpose of the study (Appendix 9) with a timeline chart (Appendix 10) designed to set out explicitly who, where and what would be involved in the sequence of data collection. The invitation letters for the child participants were reviewed by the pilot families and felt to be appropriate and were not amended (Appendix 11).

Refinements to the original data collection and analysis are described in the Measures section of this chapter (4.4).

4.3 Participants

Eleven children were recruited to participate in the main study. All of them completed the ten trial Speech and Language therapy sessions.

4.3.1 Participant Selection

At the time of the main study, Skype was unfamiliar to many potential participants and was an untested service delivery system to provide Speech and Language Therapy (apart from the pilot work in preparation for the main study). The nature of this independent practice meant that the number of referrals as well as the age and type of communication impairment varied from year to year. No external grants had been secured to fund the trial and therefore systematic recruitment of a large population of families was not feasible.

Therefore, participants were recruited through opportunistic sampling consisting of two parts: 1) Recruiting participants via advertisement, and 2) reviewing the current caseload and new referrals in relation to inclusion criteria. Recruiting participants via advertisement involved presenting a study outline on the practice website, and the annual practice newsletter sent to local professionals and the families attending sessions with the independent practice; no participants were recruited from these two sources of advertising.

A review of the practice caseload and all new referrals to the practice was carried out against three key criteria from the inclusion criteria developed by ASHA (2005).

4.3.2 Inclusion Criteria

ASHA in their technical and professional guidelines (2005) for using tele-technology set out three sets of criteria to be considered for each client: 1) the client's suitability to use tele-technology; 2) the type of therapy approach required and whether physical manipulation and touch would be required; and 3) the availability of the necessary support to facilitate and manage the technology being used. Table 11 sets out the specific ASHA criteria using tele-technology with a patient (ASHA, 2005).

Group	Specific criteria
Patient candidacy	Attention span Auditory comprehension level Literacy Cognitive ability Hearing ability Visual ability Speech intelligibility Behaviour Physical endurance Manual dexterity Age - Older than 5 years
Therapy provided	No requirement for physical manipulation/support
Facilitation	Computer availability Access to internet Appropriate physical space Access to videoconferencing unit Support from family Available support from other professionals Cultural/linguistic considerations i.e. interpreter

Table 11: ASHA criteria to determine participant suitability

Applying all these criteria to the small independent practice caseload would potentially restrict the number of participants who could be invited to participate. Three key criteria that covered patient candidacy, therapy and facilitation were considered of high importance in identifying potential participants. First, the child participant should

be 5 years or older i.e. school age; second, the child required Speech and Language Therapy that could be provided by the research Speech and Language Therapy practice and did not required physical handling or manipulation and third, the child had access, either at home or at school, to a computer with broadband internet connection and adult support. These three criteria meant that it was unlikely that there would be any unifying clinical feature common to all the participants – medical or communication aetiology.

4.3.3 Participant Invitation Process

In line with ethically reviewed procedures (UCL Graduate School Ethics Committee), the research therapist approached suitable families face to face (F2F) or on the phone to discuss the possibility of using Skype to provide Speech and Language Therapy. This discussion established whether the child met the inclusion criteria. The families were then sent the invitation letter (Appendix 7) consent form (Appendix 8), leaflet (Appendix 9) describing research projects to date that had used video-conferencing to provide Speech and Language Therapy, and also the timeline illustration that set out the form and timing of the data to be collected (Appendix 10). The children were sent a separate letter to explain how the Skype sessions would work and what they would be asked to do for the research project. Three letter formats had been produced suitable for an Infant, Junior or Secondary School aged participant (Appendix 11).

Once the signed consent form was returned, the families were supplied with the Skype training manual (Appendix 2) and any necessary peripheral equipment such as headphones, Y splitter and webcam. A date and time for a test session was arranged to ensure that the link could be made and to practice the Skype setting up process before the trial sessions began. The participants and their families were recruited throughout the study period. Nine months into the trial period, recruitment of participants ceased.

4.3.4 Participant Background

Table 12 sets out the profile characteristics of the eleven participants. Six of the participants – 3JM, 4SM, 5SM, 7JM, 8SM and 9IM - had a statement of Special Educational Need (SEN) all of which involved providing Speech and Language Therapy at various levels of intensity. The research therapist was not funded by the LEA to provide the specified Speech and Language Therapy for these children with a statement of SEN; their families had decided to fund the additional Speech and Language Therapy sessions to support the LEA funded Speech and Language Therapy. The other five participants did not qualify for a statement of SEN; three of these participants – 1JF, 2JM and 10JF - had language test scores initially that would typically have met LEA criteria for a statement of SEN but they were educated in private schools.

Participant 1JF was the older of two sisters; she had a number of medical issues both sensory and physical, some of which had been identified when she was a toddler; these included severe otitis media, severe myopia, hip dysplasia and a growth hormone deficiency. She attended a small independent but mainstream primary school with 45 other pupils. When assessed formally in 2010, at the age of 10 years, 1JF achieved percentile rank scores for 4 subtests of the Clinical Evaluation of Language Fundamentals (Semel, Wiig and Secord, 2006) that ranged from 1 to 25. Her receptive language secured a percentile rank of four and her expressive language a score of six and a score of two for memory skill. She had difficulty retaining auditory and verbal information which affected her ability to integrate information; she had age appropriate use of syntax but was not always intelligible, often missing the final syllable from words; whilst she could competently use syntax, she did struggle to organise information, answer questions, provide clear instructions or justify her reasoning. 1JF was already known to the research therapist and the goals in her therapy sessions, were at the time of the study, focused on retaining auditory information, producing clear speech at all times and organising her information to answer, justify and instruct.

	Gender	Age	New Referral	School	Communication Issues	Medical and Educational
1JF	Female	10 yrs	No	Mainstream (Private)	Memory Inference Phonology Pragmatic	Syndrome Hip dysplasia Hearing Loss Visual Impairment (severe myopia) Sensory Disorder
2JM	Male	8 yrs	Yes	Mainstream (Private)	Attention Memory Receptive Expressive Pragmatic	ASD ADD Sensory Disorder
3JM	Male	9 yrs	No	Mainstream (State)	Receptive Inference Expressive Pragmatic	Autism Dyspraxia SEN
4SM	Male	13 yrs	No	Mainstream (Private)	Inference Word Finding	Autism Hearing Loss Dyslexia SEN
5SM	Male	12 yrs	Yes	Mainstream (State)	Inference Word Finding Expressive Pragmatic	Autism Sensory Disorder SEN
6JF	Female	10 yrs	No	Mainstream (State)	Memory Inference Word Finding Pragmatic	Dyslexia
7JM	Male	11 yrs	No	Mainstream (State)	Memory Receptive Inference Word Finding Expressive Pragmatic	Syndrome SEN
8SM	Male	11 yrs	Yes	Mainstream (State)	Inference Word Finding Phonology	Dyspraxia SEN
9IM	Male	7 yrs	No	Unit in Mainstream (State)	Memory Receptive Expressive Pragmatic	ASD Dyspraxia Sensory Disorder SEN
10JF	Female	8 yrs	Yes	Mainstream (Private)	Inference Word Finding Pragmatic	Asperger's ADHD Sensory Disorder
11SF	Female	13 yrs	Yes	Mainstream (Private)	Inference Word Finding Pragmatic	Dyslexia

Key: Attention - not able to remain focused on main activity; distracted by other activity
Memory – difficulty in recalling auditory and verbal information
Receptive – not able to understand concepts and also grammatical structures
Inference – difficulty processing verbal information and linking to other knowledge
Expressive – difficulty in producing correct verbal grammatical forms
Word Finding – difficulty in learning and retrieving target words on cue
Pragmatic – inability to use language to express in appropriate manner and time

Table 12: Main study participant profiles

2JM was the younger of two children; he had a diagnosis of autism and also sensory integration difficulties and hyper-mobile joints that affected his posture. He attended an independent Montessori Primary School. He was not known to the research therapist before the study and was assessed formally as the study began; on the Listening Test (Lloyd, Peers and Foster, 2001), he achieved a percentile rank score of one and on the Renfrew Word Finding Test an age equivalent score of 4:3 years and on the Renfrew Action Picture Test (Renfrew, 1997) an information and grammatical skill age equivalent score of 3:6 years when his age at the time of testing was 7:3 years. 2JM had difficulty with understanding verbal language; his ability to process verbal language equated with a typically developing child of five years when his actual age was eight; he struggled to use language appropriately to answer, direct and request; he had been assessed in the past but no regular Speech and Language Therapy sessions had been provided; his family and teachers felt that he was increasingly isolated but he seemed keen to join in with his peers.

3JM was the younger of two brothers; at two years of age he was given a diagnosis of autism but as he developed it was felt that a more appropriate diagnosis was dyspraxia. 3JM's receptive and expressive language were in line with each other but not appropriate to his age or his non verbal skill as assessed by an Educational Psychologist; he found it hard to recall information – substance and sequence – and this reflected in how he expressed himself so that verbal instructions or a description were often disorganised and unspecific; a key observation from school was that he did not ask questions; on formal assessment when he was 9:7 years he achieved a percentile rank score below five on the Test for Reception of Grammar (Bishop, 2003). The research therapist had worked with him since his original diagnosis of autism. His parents had separated and divorced in the year previous to the study and the family finances were consequently altered and 3JM's family had to reduce the frequency of independent Speech and Language Therapy sessions; at the same time the Speech and Language Therapy sessions provided at school through his SEN were reduced as he went into Year 3; this was a concern to 3JM's family and his school.

4SM, the middle of three siblings, had been given a diagnosis of autism at two years of age; he also had a history of glue ear and had been given a diagnosis of dyslexia when

he was in ten years old. When he started full time education he was given a statement of SEN but because he later attended an independent school, the specified Learning Support and Speech and Language Therapy input was not provided although the LEA continued to monitor his progress with a meeting held annually to review his progress. 4SM was able to express his ideas verbally but struggled to integrate information at speed, recall novel subject specific vocabulary and also organise information effectively to answer questions especially in exam situations; on formal assessment when he was 11 years old, he achieved an age equivalent score on the Test of Word Knowledge (Wiig and Secord, 1992) of 8:5 years and his performance on the various subtests was wide ranging from percentile rank scores of 9 to 95.

5SM was the younger of two siblings; he had a diagnosis of autism and like 2JM hypermobile joints and low muscle tone that affected his posture. His understanding of verbal language was literal and he struggled to integrate information and also infer alternate meanings; he struggled to recall new vocabulary and found it hard to organise his ideas to answer questions or provide explanations as well as provide unambiguous directions. 5SM had been assessed when he was a pre-schooler and his helped his family to secure a statement of SEN; his Speech and Language Therapy input was reduced when he started at secondary school in keeping with the local NHS policy for pupils at Secondary School with a statement of SEN; his family were consequently dissatisfied with the level of Speech and Language Therapy input provided through his statement of SEN and felt that his literal understanding and low self esteem made him vulnerable at secondary school; he was assessed during the research trial period when he was 12:6 years old and he achieved a profile of percentile rank scores ranging from 0.1 to 75 on the Clinical Evaluation of Language Fundamentals (Semel, Wiig and Secord, 2006).

6JF was the youngest of three siblings; she was diagnosed with dyslexia at the age of eight but her difficulty was not severe enough for her to qualify for a statement of SEN and consequently she did not receive any extra support at school. She had attended Speech and Language Therapy when she was a pre-schooler because she was dysfluent but had been discharged from the local NHS service when she started full time mainstream school. When 6JF was diagnosed with dyslexia, it was recommended that

her speech and language skills were assessed; formal assessment showed that on the Test for Reception of Grammar (Bishop, 2003) and Renfrew Action Picture Test (Renfrew, 1997), she could achieve age equivalent performance scores near to her actual age of 7:11 years; but assessments that combined language skills, as in the Renfrew Bus Story Test (Renfrew, 1997), highlighted her difficulty with no use of subordinate clauses and so an age equivalent score of lower than 3:6 years and an ability to convey information age equivalent of 4:9 years; she had difficulty with short term memory and consequently word finding, processing detailed information at speed and inference; all of these led her to underperform in her school work; she was considered to be extremely shy and lacking in confidence to speak. Speech and Language Therapy sessions were scheduled fortnightly at school and by the time the main study started, 6JF had been working with the research therapist for one year. While 6JF was always compliant and cooperative, she often appeared reluctant to attend her therapy sessions and her family were not able to participate in the sessions at school.

Participant 7JM was the oldest of three siblings and had been diagnosed with Klinefelter's Syndrome Variant 48XXYY when he was three years old. This is a syndrome exclusive to boys identified by a number of dysmorphic features but is associated with language delay, learning disability and impulsive behaviour. Initially the main feature of his speech and language profile were the substantial phonological errors that made him severely unintelligible to unfamiliar listeners; alongside his intelligibility issues, 7JM also had difficulty understanding and using specific linguistic forms, inferring from information, word finding and recalling accurately auditory information; no formal assessments were used with 7JM as he was assessed annually by the NHS team and these results were not made available. As 7JM had had other areas of learning difficulty - numeracy and literacy – he had been allowed to repeat Year One so that he was in the academic year group behind his actual age. The research therapist had worked with 7JM since he was 3:6 years old and when the main study began this totalled 8 years. His Speech and Language Therapy sessions with the research therapist alternated with the LEA school based Speech and Language Therapy sessions; the research Speech and Language Therapy sessions were based at 7JM's home and in order to schedule them in with his after school activities, he had to leave

school before the end of the school day; the logistics of this appointment time meant that his younger siblings also had to leave school earlier.

8SM was the younger of non identical twins and the youngest of his three siblings. He had been given a diagnosis of dyspraxia when he was a pre-schooler and had a statement of SEN that specified Speech and Language Therapy sessions to support him in school. As he transferred to secondary school it was identified that he had other subtle issues with language that affected his performance in various school subjects, predominantly English and subjects that involved learning new vocabulary; his recall and ability to infer from verbal information was slow and he struggled with word learning and finding; on formal assessment carried out during the research trial, he achieved percentile rank scores ranging from 2 to 75 on the Clinical Evaluation of Language Fundamentals (Semel, Wiig and Secord, 2006). 8SM followed a Speech and Language Therapy programme set up by the LEA funded Speech and Language Therapy team at school with his LSA every morning; this programme was focused on improving 8SM's intelligibility.

9IM was an only child who lived with his parents and his maternal aunt and her two teenage sons in a remote village. The family were initially based in the USA where 9IM's father worked as a journalist and when 9IM was given a provisional diagnosis of autism at 2 years old, the family returned to the UK; a local paediatrician confirmed a diagnosis of ASD whilst 9IM was still a pre-schooler; his family remained uncertain about this diagnosis; he was given the additional diagnoses of dyspraxia and a sensory integration disorder after he started full time school. 9IM was verbal but his attention span short and only informal assessment was used; his need for sensory comfort was continuous and he needed to have specific favourite objects in his hands at all times along with a dummy in his mouth; his need to handle these objects continually masked his ability to play, show understanding or interact verbally with others. He attended the local nursery and then moved with his peer group to the local primary school. However, at the end of Year 1 he changed school to be in a unit specifically for children with autism and ASD attached to a mainstream primary school. The research therapist had first started working with 9IM when he was 3 years old and the family had just been given a diagnosis of ASD; the Speech and Language Therapy sessions had been

based either in his home or at his primary school; when he changed school to attend the specialist unit, the sessions were based at his home after the school day.

10JF was also an only child. She lived with her mother who was a widow; 10JF had never known her father as he died when she was a few months old. She was nearly 8 years old when she was referred for Speech and Language therapy assessment; she had no medical diagnosis at that time but later in the same year, and after the main study was over, was given a diagnosis of ADHD and in addition Asperger's Syndrome; she also had a sensory integration disorder. Her speech and language difficulty was a combination of word finding and dysfluency; she also had difficulty interacting – taking turns to talk, sharing attention, losing at a game, keeping to a topic. On formal assessment she achieved an age equivalent score of over 12 years on the Test for Reception of Grammar when she was just 7:8 years old. However, on the Renfrew Action Picture Test (Renfrew, 1997) her ability to convey information achieved an age equivalent score of 6:5 years; she achieved the same age equivalent score on the Renfrew Bus Story Test (Renfrew, 1997). 10JF had moved from a state primary school to an independent preparatory school because her behaviour in a large class had been described as disruptive; she was well managed in her class in the independent school but often failed to complete tasks and found it difficult to make friends with her peer group. NHS Speech and Language Therapy was not available to 10JF so she had been referred to the research therapist.

11SF was the younger of two siblings; her older brother having completed one degree was studying medicine. 11SF had attended regular assessment with an educational psychologist since the age of 8 years and had a diagnosis of dyslexia; at the most recent assessment with the Educational Psychologist, Speech and Language Therapy was recommended. 11SF was socially very adept and on formal assessment, using the Test of Word Knowledge (Wiig and Semel, 2003), she achieved average percentile rank scores. However, she did show on informal assessment, difficulty processing and integrating verbal information especially when unusual and unfamiliar vocabulary was used; she also struggled to organise her answers for her schoolwork and was considered to be underachieving by both her teachers and family.

The eleven participants were offered sessions either based in their home or their school. All the participants had Speech and Language Therapy goals that could be achieved using the Skype session format; for one participant – 6JF - the Skype session format meant that she did not have to leave class for therapy, and scheduling the sessions after school involved her family more actively; for another participant – 3JM – the reduced costs of the combined Skype and F2F sessions made the Speech and Language Therapy more affordable; other participants – 2JM, 4SM, 7JM, 8SM - had limited time available in their schedule that coincided with the therapist's available time, making F2F sessions difficult to schedule; some participants lived in remote villages or beyond the usual travelling zone of the therapist - 5SM, 9IM, 10JF, 11SF – so that both the travel costs and scheduling convenient appointments made it difficult to find a suitable F2F session arrangement.

4.3.5 Participants not recruited

Two families that were approached declined to take part. Table 13 sets out the basic profile of these two participants.

	Gender	Age	New Case	School	Range of Communication Issues	Medical and Educational
12IF	Female	7 yrs	No	Home Educated	Phonology Expressive	Asperger's Dyspraxia Sensory Disorder Hearing Loss SEN
13JF	Female	8 yrs	No	Main-stream (Private)	Receptive Expressive	Occupational Therapy Bilingual

Table 13: Main study declined participant profile

12IF was the younger of two siblings. She regularly attended appointments with a local paediatrician as well as the NHS Speech and Language Therapy and Occupational Therapy teams. She had a short attention span and weak listening skills; her main difficulty was a severely disordered sound system that meant her speech was unintelligible; her unintelligibility consequently limited the range of syntax she was

able to use to express herself; there were additional concerns from the paediatrician and NHS Speech and Language Therapy team that 12IF had difficulty interacting with her peers. 12IF was home educated along with her older brother; the family had not chosen home education because of 12IF's difficulties; they had already chosen home education for their son who was five years older than 12IF and already of school age before 12IF's difficulties were apparent. The family considered the Skype Speech and Language Therapy option but felt that their internet connection was unreliable and a loss of connection or distorted audio and visual connectivity would frustrate 12IF.

13JF was the older of two sisters; the family members were bilingual Japanese and English speakers. 13JF had no specific medical diagnosis but did have subtle motor planning difficulties and was seen by the local NHS Occupational Therapy team. She had difficulty both understanding and expressing herself in English and her father felt that 13JF had the same level of difficulty when speaking in Japanese. She attended a small independent mainstream primary school where the class sizes were fifteen children in a class; she also attended the Japanese School for a full day on Saturday. 13JF's family considered the Skype option but were not certain that it could be as effective as F2F Speech and Language Therapy sessions based in 13JF's school; her father was also concerned that 13JF's mother would be less able to follow English conversation through Skype than F2F.

4.3.6 Session Attendance and Drop Out

Table 14 sets out the frequency of sessions, session length, ratio of Skype to F2F sessions and the start month for each participant recruited in the main study. All eleven of the participants recruited completed 10 Speech and Language Therapy sessions, a combination of Skype and F2F, during the course of the main study period.

	Start point in Study	Session Frequency	Session Length	Number of Skype sessions	Number of F2F sessions
1JF	Sept 2009	Weekly	60 minutes	5	5
2JM	Sept 2009	Weekly	60 minutes	7	3
3JM	Nov 2009	Fortnightly	60 minutes	5	5
4SM	Sept 2009	Monthly	60 minutes	8	2
5SM	Oct 2009	Weekly	60 minutes	5	5
6JF	Nov 2009	Weekly	30 minutes	8	2
7JM	Nov 2009	6 per term	30 minutes	6	4
8SM	Nov 2009	Weekly	30 minutes	9	1
9IM	Dec 2009	Weekly	30 minutes	7	3
10JF	March 2010	Weekly	30 minutes	8	2
11SF	May 2010	Weekly	30 minutes	9	1

Table 14: Session parameters for main study participants

4.4 Measures

4.4.1 Development of the Session Profile Measure

A session profile measure was developed to capture aspects of intervention relating to *clinical activity* (number of activities completed and session goals achieved), the *technology* (number of interruptions, visual and auditory quality), *therapist- child interaction* (level of child involvement), and cost (related work activity and time).

A report card system (Wilkerson, 1998); whilst not standardised, either in the measures selected or format, and not widely adopted by health professions, enables any service to create its own evaluation tool using a standardised protocol. The report card is a series of questions or measures that are documented after a particular work activity which could be a whole session or a small work event such as a phone call with a patient; the report cards are collected over a period of time and used to reflect on the work activity and identify changes as necessary. Using a report card was considered a workable system that would be reliably used and could be adapted to the specific requirements of this research. A report card system had been used by another research project using tele-technology to provide Speech and Language Therapy (Sicotte et al, 2003); in that study the therapist rated four aspects of clinical quality on a five point scale that included quality of therapeutic relationship, control over the

client, clinical goal attainment and patient compliance. As the focus in this study was the session, the report card was renamed the session profile.

4.4.1.1 Clinical Activity

Systems already developed for measuring activity were considered advantageous as they were already validated. They would have the additional advantage that contributions from smaller research projects could be added to other studies using the same system (Whetton, 2005). Only one previous study into Speech and Language Therapy services using tele-technology had recorded clinical activity or goals achieved (Grogan-Johnson et al, 2010); however, that research had recorded the Speech and Language Therapy goals completed for those accessing the therapist F2F or through video-conferencing over the whole trial period of sessions and not the number of activities or goals completed in specific sessions. In the present study, with a repeated measures design, the goals and activities for each participant were planned to be the same in the Skype and F2F session formats and so it was possible to record the number of activities and goals completed in each session.

4.4.1.2 Technology

Tele-technology has become more user friendly and the Skype system had been selected because it was easy to use, had simplified processes and readily available online support. The technology comparison between the F2F and Skype sessions focused on the disruption of the Skype technology on the therapy session - breaks in the connection i.e. number of interruptions and the clarity of the visual and audio information in the sessions provided through Skype.

All interruptions, whether technical e.g. a break to the Skype link, screen freezing; or non-technical e.g. phone call, child needing the toilet; were recorded for each session on the session profile whether a F2F or Skype session. Each interruption was described in greater depth in the individual participant field notes and was defined as an unanticipated activity that stopped an on-going therapy related activity. With the experience of using Skype in the pilot study, it was decided that it would be useful to

record the download bandwidth speed as this was considered a factor that might influence the number of interruptions in the Skype session. This was noted at the start and end of each session using an online diagnostic tool at http://www.bbc.co.uk/iplayer/diagnostics.

Using the report card questions developed by Sicotte et al (2003), a rating for the audio and visual clarity was recorded by the therapist. Sicotte et al (2003) had not produced a rating scale for picture and sound quality that could be used, so the research therapist rated the picture and sound quality with a rating scale devised from the experience of the pilot study Skype sessions. The description ratings for the picture and sound quality are set out in Table 15.

Video Description	Quality Rating	Audio Description
Sharply defined picture	10	Clear speech
Occasional pixilation	9	One distortion of the sound
Picture freezes once	8	One instance of extra sounds
Picture freezes>2 times	7	Speech distorts but understood
Pixilation >5 times	6	Extras sounds but understood
Movement blurs picture	5	Extra sounds painful
Frozen + pixelated picture	4	Speech distorted (repeated)
Picture heavily pixelated	3	Additional noises over speech
Picture frozen	2	Speech not heard
No picture	1	No sound

Table 15: Picture and sound quality description rating

The child participant was also asked for their view about the audio and video quality at the end of each session; the adult with the child was asked to confirm that the child's description of the audio and video quality was accurate.

4.4.1.3 Participation

The report card used by Sicotte et al (2003) had rated the child's mood or level of anxiety and was relabelled as participation. Drawing on the measures of child mood and anxiety used by Sicotte et al (2003), the current thesis determined the child's level of participation by a therapist, rating their level of involvement in the session and their apparent level of anxiety. To determine the child's level of involvement, the child was

asked after each session how they felt they had been able to participate – had they been able to speak comfortably to the therapist. For the second aspect, the therapist rated how anxious the child appeared to be in the session; any repetitive body movements such as flapping hands or moving up and down in their chair, were taken to be an indication that the child was anxious and was based on experience of working with that child; the adults were also asked about the child's behaviour at the end of a session; the therapist expanded her observations of the child's mood and anxiety level in the field notes as it was considered likely to require some justification and description. Both the questions and observations contributed to determining the anxiety level of the child. A binary code was used to rate involvement and anxiety; 1 equalled being able to talk freely to the therapist and being relaxed whilst 0 equalled being unable to speak freely or showing any level of anxiety).

4.4.1.4 Therapist Work Activity/Cost

A number of research reviews have highlighted the need to identify the costs in providing remote Speech and Language Therapy (Hill and Theodoros, 2002; Whetton, 2005) if there is to be any headway in the profession using tele-technology to provide a service. When cost has been considered in prior research, it has been the summation of all the costs to provide a particular type of service – travel, time, tele-technology equipment purchase and running costs (Katsavarus, 2001). The session profile was identified as a way to facilitate recording data that could link to the cost to provide specific sessions.

A cost analysis needs to define its parameters (Eiserman, McCoun and Escobar, 1990) and for this research the costs of setting up a new service delivery in comparison to an already established service format skew results. More appropriate would be a comparison of the running costs of providing the Speech and Language Therapy service – both F2F and Skype – with information that could be linked to specific sessions for each participant. In only one study in the literature has the time to provide the actual session been used in the calculation rather than all the peripheral activity that is needed (Lemaire et al, 2001).

To calculate costs that could be linked to a specific session, it was necessary to develop an appropriate work activity record. First, typical work activity carried out to provide a F2F Speech and Language Therapy service was identified over the period of a month; the list was extensive and included a total of 13 different activities which could be grouped into either clinical activity i.e. activity that could be linked to a specific client or non-clinical activity which was necessary activity for running the service but not linked to a specific client. Table 16 lists the identified work activity.

	Work Activity	Type
1	Planning session plans	Clinical
2	Preparing equipment	Clinical
3	Therapy sessions	Clinical
4	Writing up session plans/notes	Clinical
5	Report writing	Clinical
6	Liaison i.e. discussing actual session with a parent/teacher; making future arrangements, planning or discussing issues not immediately linked to the session itself	Clinical
7	Inquiries	Clinical
8	Equipment = purchase/repair	Non Clinical
9	Continuing Professional Development (CPD)	Non clinical
10	Miscellaneous administration	Non clinical
11	Finance	Non clinical
12	Travelling Time	Non clinical
13	Setting up/packing up	Non clinical

Table 16: Therapist work activity

As well as the basic time sheet, additional information was collected that was specific to a particular day. This information included the date, number of clients seen, amount of earnings and other unanticipated costs that were incurred as well as driving conditions. Work activity timings were added to the travelling time to ensure that this matched the total working time indicated on the start and end time record. The timesheet can be seen in Appendix 12.

All the work activity of the research therapist was recorded, so if an activity was shared with other children who were not research participants, the work activity time was divided between all who had experienced that activity; the activities that were typically shared included travel and preparation time, time for loading and unloading

of equipment and materials, and time spent signing-in at schools. Costs from these activities were linked to the F2F and not the Skype sessions.

As well as identifying how much time was used to deliver the specific Speech and Language Therapy session, it was necessary to calculate additional running costs needed to provide those sessions. Four running costs were identified: internet access, mobile phone calls, landline phone calls and costs of travel by car; it was decided that internet, mobile phone and landline telephone calls would not be costed as these were used to support the practice management and administration and consequently supported both session formats; Skype calls did not incur any call charges so there was no charge to record for the Skype sessions. However, the motor car costs were specific to the F2F sessions; the actual miles travelled each day were recorded on the timesheet; the travel time and mileage were then divided by the number of clients visited to calculate each participant's share of the travel costs and this information was included on the specific session profile; to obtain a cost, the miles travelled for a whole day was divided between the number of children visited by the therapist in the course of that recorded mileage. The actual mileage cost per participant was calculated using the AA guide (http:theaa.com/allaboutcars/advice) of 0.42p for a petrol vehicle with 1800cc engine size (2009). The cost of the therapist time was considered to be equal regardless of the session format and for ease of calculation was set at £1 per minute.

4.4.2 Session Profile Summary

For each participant, session information collected via the session profile addressed four aspects of service delivery – clinical activity, the performance of the technology, the child's participation and the costs of providing the session. The same session profile, set out in Table 17, was used for both session formats although some of the information was relevant only to the F2F session or the Skype session. The technical difficulties and bandwidth (items 3 and 5) were specific to the Skype sessions and whilst the questions to the child participant (items 6 to 11) were focused on identifying the audio and visual quality of the Skype sessions and also the child's participation and mood, all apart from 6 and 7 were completed for the F2F sessions.

Participant ID			
Date and time			
Session Format		Skype or F2F	
CLINICAL ACTIVITY			
1	Number of goals completed in session	/ goals	
2	Number of activities used in session	activities	
TECHNOLOGY			
3	Bandwidth	*Before*	*After*
4	Number of interruptions		
5	Technical Difficulties		
		Participant	Therapist
6	Have you been able to see the therapist and the games clearly?		
7	Have you been able to hear what the therapist said?		
THERAPIST –CHILD INTERACTION			
8	Have you been able to say what you wanted to say to the therapist?		
9	What activities did you like?		
10	What activities did you not like?		
11	Are you happy to continue with the Skype sessions?		
THERAPIST WORK ACTIVITY/COST			
I	Length of session	Mins	
Ii	Length of liaison	Mins	
Iii	Length of session plan write up	Mins	
Iv	Length of session plan prep for next session	Mins	
	Total Time spent	Mins	
Other Observations Participant Anxiety Mileage: Driving conditions: Researcher Initials:			

Table 17: Session Profile

The number of goals achieved in that session were coded and this formed the clinical activity score; the number of interruptions in the session were noted and the therapist rated the audio and video quality on a graded rating scale as well as asking the child for a subjective evaluation of the video and audio in the session which were also coded and combined as the technology score; the therapist rated the child's participation in the session as a whole and the child was asked about which activities they had enjoyed in the session and how it felt to talk to the therapist in that session which were then coded and combined as the participation score; finally the work activity time needed to provide the session along with additional costs of travel and mileage for the F2F sessions were totalled up for each session and then divided by the number of minutes of the scheduled session i.e. 30 or 60 minutes; this figure was the cost to provide per minute for that specific session; these figures for a participant's F2F and also their Skype sessions were added together and an average cost to provide the F2F and Skype sessions calculated; this was then coded. The coding for each session was entered into an Excel spreadsheet.

Other factors that might have influenced the number of activities completed in a session or work activity timings were noted. These included factors that might influence the technology link in the Skype sessions i.e. download speed at the beginning and end of the session was consequently measured; traffic conditions i.e. weather, roadworks, accidents could influence travel time for F2F sessions and were also noted. Field notes were used alongside the session profile for each participant so that more detail about any aspect of the session could be noted and referred to as necessary. All the data sources in the session profile were translated into numerical rating scales. Table 18 sets out the rating scale used for each data source.

Data Set	Data Measurement	Analysis Rating
Clinical Activity		
Session goals achieved	More than 75%	3
	51 to 74%	2
	26 to 50%	1
	25% or less	0
Technology		
Number of interruptions e.g. toilet breaks, phone calls, loss of the connection	None	2
	1 to 3	1
	More than 3	0
Visual Quality	>8 out of 10	2
	5 – 8 out of 10	1
	< 5 out of 10	0
Audio quality	>8 out of 10	2
	5 – 8 out of ten	1
	<5 out of 10	0
Therapist-child Interaction		
Participation	Able to say what they wanted	1
	Unable to speak	0
Anxiety	No sign of anxiety	1
	Signs of anxiety	0
Therapist Work Activity/Cost		
Cost	Less than £2.00	3
	Range of £2.01 to £3.00	2
	Range of £3.01 to £4.00	1
	Greater than £4.00	0

Table 18: Session profile data rating scales

The data scores for sessions in each format were added together and this was divided by the number of sessions delivered in that format to obtain an average score per session. The clinical activity, technology, interaction i.e. participation and cost line averages were set out for each participant as shown in Table 19 alongside the other participants. All four of these scores were then added together to provide a composite score for each participant for their Skype and F2F sessions.

	Aspect of Acceptability	Participant		Participant		Participant	
	Session Format	Skype	F2F	Skype	F2F	Skype	F2F
	Total Number of Sessions						
1	Clinical Activity Acceptability						
2	Technology Acceptability						
3	Participation Acceptability (interaction)						
4	Cost						
	Composite Score (total of above scores)						

Table 19: Participant session profile composite score sheet

The different aspects of acceptability that made up the composite score did not have equal maximum scores; for the clinical activity and cost, the maximum score any session could realise was three, whilst for technology this was ten and for participation the maximum score was four. This creates a bias with the technology score making up the most of the composite score not just because of the higher maximum score but because the F2F sessions would always achieve a high score of at least 8 as audio and visual quality would not be an issue; however, it was the same process for each participant and if the Skype sessions achieved composite scores equal to the F2F sessions this was in spite of the bias in the technology score. The composite score was used to rate the overall acceptability of that session format for that participant. The higher the composite score the more acceptable that session format.

4.4.3 Development of the Questionnaire Measure

A questionnaire measure was developed to capture the views of the adults supporting both the F2F and Skype therapy sessions – the clinical activity, the technology and therapist-child interaction. The questionnaire was presented twice to identify any shift in the adult views about the clinical activity, technology and therapist-child interaction.

Whilst the research was addressing concerns identified by therapists, obtaining the opinion of adults involved with the therapy would help the researcher to evaluate whether a Skype Speech and Language Therapy service was considered acceptable to the client. Research reported in the literature review had generally only asked for participant views after a research trial or typically on a single occasion during the research process (Scheideman et al, 2000, McCullough, 2001, Wilson et al, 2004). The

present study was interested in identifying views of participants at the beginning of the trial (pre; specifically after the second Skype session) with their views once the trial was completed (post; after 10 trials had been completed) via a questionnaire. Repeating the questionnaire would also correct for the Gartner Hype cycle effect (Cranen et al, 2011), so that the positive views that often come with trialling a new product could be reviewed to see if such enthusiasm was maintained or lessened with experience. Using questionnaires was identified as the most efficient method to collect the adults' views and allowing participants the flexibility to complete a questionnaire in their own time would support successful completion and return of the questionnaires (Gillham, 2000a). Identical questions were asked in the two questionnaires.

The Pre Questionnaire (questionnaire 1) comprised three sections. The first (comprising 5 questions) aimed to gauge the adult's level of computer competence and included questions on computer use, experience and familiarity with video-conferencing. The second section (questions six, seven and eight) examined Issues related to technology, therapist-child interaction and clinical activity. The final section asked the respondent to identify any benefits or drawbacks to using Skype to provide their child's Speech and Language Therapy (see Appendix 13 for Questionnaire 1)

The post questionnaire (Questionnaire 2) mirrored questionnaire 1 (see Appendix 14 for Questionnaire 2) except that the first section on computer competence was replaced with questions concerning the management of the Skype sessions

The second section of both questionnaires explored issues related to technology, interaction and activity and drew on a questionnaire developed by Yip, Chang, Chan and MacKenzie (2003) to identify patient satisfaction with medical services provided remotely. This had already been adapted and used by two other Speech and Language Therapy services using tele-technology (Styles, 2008, Tindall et al, 2008). In the current study respondents were asked to circle the number that best corresponded with their agreement or disagreement with a set of statements; a Likert scale from 1 to 7 was used in order that change in participant view would be observed. Following on from the pilot, the statements were grouped so that they were linked to three aspects of

acceptability - technology, interaction and clinical activity. Table 20 sets out the complete set of 21 statements grouped as question 6, 7 and 8. Positive and negative statements were used and grammatical style varied to avoid being repetitive. `The questionnaires were proof read and then trialled by two colleagues to check that the questionnaire could be completed using the instructions; an estimated time of 20 minutes to complete each questionnaire was calculated.

Question 6 – Technology	
A	It will be difficult to hear the Therapist in the Skype sessions
B	I will need assistance to use the Skype system
C	I will be able to see the Therapist on the screen clearly
D	I anticipate that I will be happy to continue with Speech and Language Therapy sessions via Skype
Question 7 – Interaction	
A	It will take longer to discuss my child's progress with the Therapist on Skype
B	I shall be able to talk to the Therapist with ease in the Skype sessions
C	My child will be able to follow the Therapist's instructions just the same as when F2F
D	My child will be less able to concentrate in the Skype sessions than the F2F sessions
E	The therapist will be able to respond to my child's communication attempts just the same as when working F2F.
F	My child will be less able to interact with the therapist in the Skype sessions than in the F2F sessions.
G	I anticipate that I will be satisfied with the interaction between my child and the Therapist when working through Skype.
Question 8 – clinical activity	
A	My child will be able to access a Speech and Language Therapy service using Skype which otherwise would not be possible.
B	The Skype Speech and Language Therapy sessions will fit in just as well with my child's schedule as the F2F sessions.
C	I will get the same attention from the Therapist in the Skype sessions as F2F.
D	I will be able to make contact with the Therapist more readily through Skype and email
E	I will be more involved in the Skype sessions than the F2F sessions.
F	I think that the Skype Speech and Language Therapy sessions will be consistently the same standard as each other.
G	Skype Speech and Language Therapy sessions will enable my child to develop their speech and language skills.
H	My child's progress with Skype Speech and Language will be the same as in F2F sessions.
I	The activities in the Skype Speech and Language Therapy sessions will be as enjoyable as in the F2F sessions.
J	I think that using Skype will be an acceptable way to have Speech and Language Therapy sessions.

Table 20: Questionnaire 21 statements targeting technology, interaction and clinical activity

4.4.4 Questionnaire Scoring

Individual responses from the first section on computer competency from questionnaire 1 (questions 1 to 5) were collated to give each respondent a computer competency rating between 0 and a maximum of 8: the higher the rating the more computer competent the respondent was. Table 21 sets out the rating value based on responses to these five questions.

	Questions	Rating value
1	< 5 hours per week using the computer	0
	5 - 10 hours per week using the computer	1
	11 – 20 hours per week using the computer	2
	>20 hours per week using the computer	3
2	Using computer in <3 locations	0
	Using computer in >3 locations	1
3	Using computer for <3 activities	0
	Using the computer for >3 activities	1
4	Personal rating of computer skill 1 or 2	0
	Personal rating of computer skill of 3, 4 or 5	1
	Personal rating of computer skill of 6 or 7	2
5	Has never used video-conferencing previously	0
	Has used video-conferencing previously	1
	Participant total rating out of a maximum of 8	

Table 21: Adult participant computer competency rating

Ratings for the second section examining issues related to technology, interaction and clinical activity (statements 6, 7 and 8) were placed into one of three groups: responses with an agreement rating of 1 or 2 were given a score of 2; those with an agreement of 3, 4 or 5 a score of 1, and those with an agreement rating of 6 or 7 a score of 0. Greater agreement to some of the statements did not correspond with greater acceptance; for these statements the rating based on the response was reversed so that an agreement of 1 or 2 was given a score of 0. Consequently, for each adult participant there was a rating of their acceptance of the technology with a maximum rating of 8, the interaction with a maximum rating of 14 and the clinical activity with a maximum rating of 20. For each adult participant, these rating scores were combined to provide a total acceptance rating before and after the trial. Table 22 sets out the adults' ratings in the spreadsheet format.

Rating from questionnaire response 1 or 2 = 0 3, 4 or 5 = 1 6 or 7 = 2		Participant	
		Questionnaire 1	Questionnaire 2
6a	Hearing quality (reversed rating)		
6b	Assistance needed (reversed rating)		
6c	Visual quality		
6d	Happy to continue with Skype		
	Total out of 8 maximum		
7a	Less time to talk (reversed rating)		
7b	Talk with ease		
7c	Child can understand just the same as F2F		
7d	Child less able to concentrate (reversed rating)		
7e	Therapist able to respond to child's mood		
7f	Therapist less able to interact with child (reversed rating)		
7g	Satisfied with interaction between child and therapist		
	Total out of 14 maximum		
8a	Able to access sessions better through Skype		
8b	Skype sessions fit in well		
8c	Adequate attention from therapist		
8d	Able to make contact more readily		
8e	More involved in Skype sessions		
8f	Skype sessions consistently the same		
8g	Skype sessions enable child to develop		
8h	Progress the same in Skype and F2F sessions		
8i	Skype session activities enjoyable		
8j	Skype sessions acceptable		
	Total out of a maximum of 20		
	Combined Total out of a maximum of 42		

Table 22: Sample Excel spreadsheet for adult participants

4.4.5 Development of the Child Interview Measure

An interview measure was developed to capture the children's views on the clinical activity, the technology and the therapist-child interaction after they had experienced the complete trial of ten therapy sessions.

The views of the child participants concerning Skype and F2F were considered just as important as the adult views and interviewing the children was considered the most appropriate way to gain their views on the Skype and F2F Speech and Language Therapy sessions, bearing in mind the potential wide age range of the children and their differing communication impairments.

The interview design replicated the content of the adult questionnaire by examining children's computer experience and knowledge i.e. their computer competence, their views on the Skype technology, their views on the interaction with the therapist, the activities used in the Skype sessions, their acceptance of the Skype sessions and finally their views that might not have been covered by any of the previous questions. The questions were grouped in six differently coloured envelopes according to topic, that the child selected in their own preferred sequence. The complete set of questions can be seen in Appendix 15.

The children were interviewed after the trial of ten sessions was completed. The child selected where they would be interviewed, who would be present and how their answers would be noted – dictaphone (Sony ICD-BX112 digital voice recorder), video recorder (Sony Handycam 2000X) or handwritten – in order that they would be more at ease and maintain their level of attention (Freeman and Mathieson, 2009).

The children's responses were then transcribed and their responses given a numerical rating. Table 23 sets out the rating scale related to the child's responses.

The higher the numerical rating for a child's response, the greater acceptance of the technology, interaction, clinical activities and Skype sessions. Some of the parameters in the four key areas – the technology, interaction, clinical activities and Skype sessions - combined two responses from the interview. So in the Technology section of the spreadsheet the parameter on improvement of the visual quality combined two questions from the interview – a direct question that asked the child to identify any improvements that could be made and also the question that asked for their agreement with opposing views from other children about the visual quality of the Skype session.

Computer Competency		Rating	Participant	Participant
	6 hours or more	1		
	5 hours or less	0		
	5 or more activities	2		
	3 or 4 activities	1		
	<2 activities	0		
	Very good	2		
	Okay and average	1		
	Not good	0		
	Used Skype before	1		
	Not used Skype before	0		
	No support needed to set up Skype for session	1		
	Support needed	0		
Total out of a maximum of 8				
Technology				
	Seen Speech and Language Therapy okay	1		
	Not seen Speech and Language Therapy okay	0		
	Picture could be improved	1		
	Picture could not be improved	0		
	Could see activities okay	1		
	Could not see activities okay	0		
	Could hear the Speech and Language Therapy okay	1		
	Could not hear the Speech and Language Therapy okay	0		
	Nothing to improve the sound	1		
	Need to improve the sound	0		
Total out of 8				
Interaction				
	Could follow instructions from Therapist	1		
	Could not follow instructions from Therapist	0		
	Could say what you wanted	1		
	Could not say what you wanted	0		
	Been able to talk easily	1		
	Not been able to talk easily	0		
	Therapist has responded okay	1		
	Therapist has not responded	0		
Total out of a maximum of 4				
Speech and Language Therapy Skype Sessions				
	Like Speech and Language Therapy Skype activities	1		
	Did not like Speech and Language Therapy Skype activities	0		
Total out of a maximum of 1				
Acceptance of Skype Speech and Language Therapy				
	Like the Skype Speech and Language Therapy	1		
	Do not like the Skype Therapy sessions	0		
	Skype and F2F are the same	1		
	Skype and F2F are not the same	0		
	Easy to fit in sessions	1		
	Not easy to fit in the sessions	0		
	Did not miss lessons	1		
	Did miss lessons	0		
	Prefer Skype	2		
	Like both	1		
	Prefer F2F	0		
Total out of a maximum of 6				
Final Total out of a maximum of 27				

Table 23: Collated interview responses spreadsheet

4.4.6 Development of the Interaction Measure

An interaction measure was developed to identify for each speaker in both session formats the similarities and also differences in their number of turns as well as purpose of their turn (Move) and also the number and purpose of their utterances in both session formats.

Therapists in the ASHA survey (2002) were concerned that interaction between therapist and client in a remotely conducted Speech and Language Therapy session would be different and the implication was that this difference would interfere with the Speech and Language Therapy process. This concern was not discussed in greater detail in that survey. Therapists may have anticipated loss of a smooth communication exchange, exacerbating a client's communication impairment and so protracting the Speech and Language Therapy process. Alternatively, they may have felt that without other communication channels such as touch, there could potentially be a loss of rapport between the therapist and client, disrupting the Speech and Language Therapy process. In order to address this major concern, the current study aimed to compare key features of interaction between the therapist and children in Skype and F2F sessions

There is one research paper that has examined interaction between health practitioners and clients (Miller, 2011) but this research did not directly compare the same client and health practitioner in F2F and remote interaction carrying out the same or similar tasks (Miller, 2011). To date, only one of the studies focused on remote Speech and Language Therapy services has examined the interaction in the remote therapy session (Katsavarus, 2001); however, this research limited the analysis to the topics covered by the therapist and the adult at the remote end and not the client and did not evaluate the interaction in the F2F sessions between a therapist and the adult.

A small body of research (Anderson et al, 1996, Bruce, 1996, O'Malley et al, 1996) that has investigated the interaction of speakers in a video-conferencing and F2F situation has identified a number of features that could support the acceptability of Skype

Speech and Language Therapy sessions. These specific interaction features are set out in Table 24.

	Measure of Acceptability
1	Equal number of turns between speakers indicates a minimal delay on video/audio link
2	A low number of clarifications provided or requested could indicate minimal distortions with audio and video
3	A low number of turns needed to complete an activity could suggest more goals completed in a session

Table 24: Acceptable interaction measures

Anderson and colleagues (1996) suggest that an equal number of turns between video-conferencing and F2F may represent a relatively smooth flow in the interaction in both contexts, and that the audio and video delay that might be anticipated in Skype had no demonstrable impact on the interaction. The number of requests or provisions of clarifications in the Skype session may also be indicative of the potential impact of audio or visual distortion, with relatively few requests or provision of clarifications suggesting that the flow of the interaction was not compromised (Anderson et al, 1996). They also suggest that the number of turns carried out by participants cannot necessarily be equated with levels of activity if the same goals were achieved between video-conferencing and F2F (Anderson et al, 1996).

4.4.6.1 Video Recording procedure

Two video recordings were to be made – one of each session format for each participant. It was anticipated that some of the children recruited to participate would already be familiar with F2F Speech and Language Therapy. It was, however, felt necessary that the children should experience a few Skype Speech and Language Therapy sessions in order to become more familiar with this Speech and Language Therapy format before any video recording was made. No F2F or Skype Speech and Language Therapy session for any participant was video-recorded until at least four Skype Speech and Language Therapy sessions had been completed. The complete session, whether half an hour or a full hour, was video-recorded in full.

To ensure that similar activities and goals were carried out in the two sessions that were video-recorded and so limit the introduction of different activities that might influence any changes identified in the interaction between the speakers in the two session formats, the video recordings of the two session formats were adjacent sessions.

It was noted in the Pilot Study Skype session recordings that there was a slight delay, with the audio lagging behind the video that had not been noted at the time of the recording by the therapist. No action was identified that could minimise this delay and it was not felt to interfere with the accuracy of the transcription.

In the F2F sessions, the participants and therapist periodically moved out of sight of the camera. In the Skype Speech and Language Therapy recordings, the therapist and participant were more static; occasionally gestures and facial expressions were not reliably captured in the Skype Speech and Language Therapy sessions because the quality of the picture on the computer varied and was dependent on the internet download speed. No action was identified that could improve the picture quality in these recordings.

As the F2F recordings would be in a variety of home and school locations, a standard camera placement would not be practical; it was also considered important that the child participant was relaxed about the camera recording so the child was allowed to choose where to place the camera. These factors limited the visibility of some features of the interaction. Nevertheless, having the video information rather than just audio data supported the transcription process and helped determine utterance function and moves in the discourse coding.

4.4.6.2 Development of the Transcription Protocol and Discourse Coding

Although other research into therapist/child interaction had generally taken only a small section of any recording for analysis (Prutting, 1978, Letts, 1985), the complete video recordings were transcribed in the present study primarily because participants

engaged in a wide range of activities and children's communication issues and goals varied making the selection of similar extracts for all participants difficult.

Each DVD recording was transcribed from the DVD into an A4 notebook. The transcription protocol followed is set out in Table 25.

Stage	Transcription Protocol
1	Listen and write down what is said - turn by turn – by hand in the transcription notebook using a pencil
2	For each utterance use a new line and when the turn changes to another speaker leave a blank line to help indicate and mark out that there is a change of speaker.
3	The text should be written as it is actually said so that natural abbreviations of the speaker are written e.g. = 'we'll', 'gonna', 'they're' rather than the full form of 'we shall', 'going to' and 'they are' respectively.
4	Indicate on the left hand side in the margin who is the speaker using the following key: a) Rebecca Matthews = RM b) Child Participant = use their unique code which can be seen on the DVD c) Parent = Dad or Mum whichever is appropriate.
5	List laughing and smiling as a turn if nothing is said by a speaker as it represents a response even if non-verbal.
6	Listen again and fill in any missing parts of the conversation and modify or correct where necessary, this time using black biro.
7	Some of what is said may not be easily transcribed because it is unintelligible or simply too quietly said to be heard on the recording. For these instances indicate with dashes the number of words that were heard but could not be transcribed.
8	To record overlaps Both conversation partners may speak at the same time – different utterances – perhaps after a pause or when one conversation partner hasn't responded. Write down what you can of both utterances and then link the two together with brackets – {in the margin.
9	To record interruptions One conversation partner/speaker takes the opportunity to speak and 'interrupt' the turn of the other speaker to make a point or ask a question. In this instance write each utterance down and then underline/highlight the two utterances in green to indicate that the second utterance was used to interrupt the turn of the first speaker.

Table 25: Transcription protocol

A turn was defined as a single or combination of utterances from one speaker. The end of a turn marked the start of another speaker's opportunity for a turn and was identified by the speaker intonation and pause that was not filled with any further

utterances from the current speaker. It was possible that another speaker might not respond verbally but gesture or silence would form their turn.

Before any coding was carried out the transcription texts were transferred to Word and set out in three columns in landscape view; the first two columns corresponded to the pencil written transcriptions – the speaker and the transcribed text - whilst the third column was left blank for coding. Because it was not possible to limit movement of children out of range of the camera in the F2F sessions, body movements and facial gestures were not included in the transcription notation scheme.

The coding scheme developed by Pennington and McConachie (1999) was adopted for the study. It was a system that had been used with communication impaired children which covered three core aspects of interaction – (i) each speaker's turn or move, (ii) individual utterance functions and the (iii) mode of communication for each utterance. The full coding scheme, available in Appendix 16 is outlined in Table 26.

It was anticipated that none of the participants to be recruited to the main study would be users of augmentative and alternative communication (AAC); consequently the category for AAC Mode was removed. In the original coding scheme, utterances that requested clarification were allocated to one of three possible codings but these groups were collapsed into one group as it was anticipated that there would be fewer requests for clarification that could be discretely grouped this way and it would be of greater value to consider requests for clarification as a single group. The same was felt to be true for the utterances that provided clarification – in the original Pennington and McConachie (1999) coding there were two groups of providing clarification utterances.

MOVES		
Initiation	I	Introduce a topic and requires a response – can be within a theme
Responses	R	A reply to an initiation (I or R/I or F/I)
Response/Initiation	R/I	A reply that also requires a reply
No Response	NR	No response heard or made even with gesture or vocalization
Follow up	F	A response that keeps to the topic but no response requested
Follow up/ Initiation	F/I	A response that keeps to the topic but a response requested although not a direct question
FUNCTIONS		
Request for joint attention	**RJA**	Attract attention to topic
Request for information	**RI**	Seeking knowledge on topic, activities, people etc..
Request for object or action	**ROA**	Asking listener to respond with handing over object or doing an activity
Request for clarification or confirmation	**RCC**	Previous message is restated but not exact repetition
Provision of information	**PI**	Comment on situation, people, action, etc
Provision of feedback *	**PF**	Comment that talks about performance either speaker or listener
Provision of prompt *	**PP**	Utterance that leads listener to complete or come up with an answer
Provision of stall *	**PS**	Comment that enables speaker to hold onto their turn so stalling
Provision of clarification – revision	**PCrev**	Previous message repeated exactly or repeated in meaning but not exact wording
Self or shared expression	**NSSE**	No extra information added but indicates mood of the speaker
Acknowledgement	**NACK**	No extra information but confirms message is hard and understood
Confirmation/denial	**NCD**	A statement to agree or disagree
Unintelligible	**Nunintell**	Message not understood by transcriber but may be interpreted by the conversation partner and responded to
MODE		
Verbal	*V*	Speech – either intelligible or unintelligible
Vocalisation	*Voc*	Sounds – not speech which has a meaning that can be interpreted
Gesture	*Gest*	Specific or unspecific that can convey a meaning such as laughing/pointing
Verbal + vocalization*	*VVoc*	Combination of both speech and sounds

* new codes incorporated into Pennington's original discourse coding

Table 26: Revised discourse coding

Three additional codes were included in the utterance function coding for utterances – all were utterances with a providing function. The conversation partners in the present study were an adult professional and child, unlike the previous therapy conversation studies where the conversation partners were a parent and child or children in conversation with each other. For example, there were a number of utterances that could be classed as providing information (PI) but in actual fact had a very specific purpose within therapeutic discourse that could be distinguished from just providing information. Prompts were used to help the child with their next turn or response e.g. 'You've got to think of some differences between this and this (pointing to the cards)' and also praise or provision of specific feedback for the child on how they had performed in an activity e.g. 'Good question' 'expert play'. Two new categories were created for these: Provision of Prompt (PP) and Provision of Feedback (PF) respectively. The pilot study revealed the participants' use of many short phrases such as 'hang on' or 'um' which appeared to allow the speaker to hold on to their turn in the fast paced conversation of verbal conversation partners; these 'turn maintenance' utterances were assigned a new code: Provision of Stalling, coded as PS.

In relation to mode, a number of utterances were used which combined verbal and vocalization modes in the same utterance e.g. 'Oooo okay sorry'. Consequently, a new Mode coding of VVoc was introduced to apply to an utterance that combined both vocalizations and verbal speech.

The application of the coding system involved three stages. In the first stage, a turn, was allocated to one of five moves – an initiation (I), a response (R), Response with Initiation (R/I), a Follow up (F) and Follow up with Initiation (F/I). A turn was made up of one or more utterances from an individual speaker; the utterances can be any length and follow on from each other. An utterance was identified by the syntax, contained an idea and a single purpose and was marked by intonation. An example for each of the five moves is set out in Figure 6.

Speaker	Utterance	**Function**	*Mode*	Move
RM	Right			I
	Are you ready?			
PS1	Does your vehicle have four wheels			R/I
RM	No			R
	So			
	You've got to get rid of quite a few			
Tutor	Well done			F
	There's a couple more with four wheels there			
RM	A _____ has probably got about 6 wheels I think			F
Tutor	Yeah			F/I
	And PS1 is wondering about the harvester			

Figure 6: The Five Discourse Move Codes (PS1 Skype session transcription)

In the second stage the mode of each move was determined Verbal (V), Vocalisation (Voc) Verbal and Vocalisation (VVoc) and Gesture (Gest). An example of each of the different mode codings is set out in Figure 7.

Speaker	Utterance	**Function**	*Mode*	Move
RM	Oh		*Voc*	F
Tutor	But		*V*	F
	Oh		*Voc*	
RM	And suppose in others they're quite hysterical aren't they		*V*	F/I
Mum	Mmm Yeah		*VVoc*	R

Figure 7: The Four Discourse Modes (PS1 F2F session transcription)

In the third stage each utterance was coded for its function. There were a total of 13 function codes. Figure 8 shows a section of coding completed for all three aspects.

Speaker	Utterance	**Function**	*Mode*	Move
RM	Can you hand those over and I'll put them in the box	**ROA**	*V*	I
	What we want to d now is play Guess Who with you	**PI**	*V*	
PS1	Argh ha ha ha ha	**NSSE**	*Voc*	F
RM	Using the Simpsons	**PI**	*V*	F
PS1	Woah he he he he	**NSSE**	*Voc*	F
Tutor	We've just started playing guess who? where we have 2 character each	**PI**	*V*	I
RM	Oh my goodness me	**NACK**	*V*	F
Tutor	It's hard	**PI**	*V*	F
	It's hard	**Pcrep**	*V*	
RM	I don't think I've ever played it with	**Pcrep**	*V*	
Tutor	To think about whether either or neither	**PI**	*V*	F
RM	Nodding head +++	**NACK**	*Gest*	F
	Oh I see you mean	**CD**	*V*	
	Right	**NACK**	*V*	

Figure 8: Utterance Function Coding (PS1 F2F session transcription)

Some of the interaction analysis was difficult to assign to a single category, most notably the utterance functions. Some utterances could be assigned to a different function category, and some functions were more likely to be confused with each other. The main categories affected were Confirmation/Denial (NCD), Acknowledgement (NACK) and Provision of Information (PI). Typically a 'Yes' or 'No' utterance function could be identified as a NCD as in Figure 9.

Speaker	Utterance	**Function**	*Mode*	Move
Tutor	Is the joker that that funny	**RI**		I
PS1	Yeah	**NCD**		R
RM	No	**NCD**		F

Figure 9: Yes coded as Confirmation/Denial (PS1 F2F session transcription)

Another utterance coded as a NCD might be more than just the word 'yes' or 'no' as in Figure 10. In isolation the function code for the utterance 'you're not' might be PI.

Speaker	Utterance	**Function**	*Mode*	Move
RM	And I'm not playing the game	**PI**		F/I
Tutor	You're not	**NCD**		R
RM	I'm not doing the rules at all	**PI**		F/I

Figure 10: Phrase as Confirmation/Denial (PS1 F2F session transcription)

Equally the function of a 'yes' or 'no' could be coded as a PI as shown in Figure 11.

Speaker	Utterance	**Function**	*Mode*	Move
PS1	Is your person got hair?	**RI**		I
RM	Yes	**PI**		R

Figure 11: Yes coded as Providing Information (PS1 F2F session transcription)

Alternatively a 'yes' or 'no' could be coded as an acknowledgement (NACK) as shown in Figure 12.

Speaker	Utterance	**Function**	*Mode*	Move
Tutor	To think about whether either or neither	**PI**		F
RM	Nodding head+++	**NACK**		F
	Oh I see you mean	**NCD**		
	Right	**NACK**		

Figure 12: Yes coded as Acknowledgement (PS1 F2F session transcription)

In all of the above instances local interaction context (i.e. previous and following utterances) was examined to support decision making If this first review did not enable a specific coding to be selected then the video recording was reviewed to see if prosodic features, facial expression or gesture could be used to support a particular function code.

An example of ambiguity that required careful review is 'Alright' (Figure 13); this could have been coded with NCD or NACK or RJA. It was however, coded as RJA because whilst RM's turn could have confirmed with NCD the tutor's observation or indeed acknowledged the observation, the intonation of rise-fall on 'alright' suggested that 'alright' was being used to return to the turn taking format of the game and reviewing the video recording confirmed this.

Speaker	Utterance	**Function**	*Mode*	Move
RM	Yeah	**NCD**		F/I
	Laughing	**NSSE**		
	I'm trying to find all these characters	**PI**		
	OK	**RJA**		
Tutor	They aren't set out the same way as his	**PI**		F
RM	Alright	**RJA**		F/I

Figure 13: The Function Code for 'Alright' (PS1 F2F session transcription)

4.5 Procedures

This section sets out the data collection schedule for each participant involved in the main study as well as describing the data collected and the analysis process followed.

A session profile was completed after each session, the first questionnaire was sent to the adults after the second Skype session and after four Skype sessions, two sessions were video recorded in full; once the trial of ten sessions was completed the adults were asked to complete a second questionnaire and the children were interviewed. The complete data collection schedule for each participant is set out in Table 27.

Participant	Sept '09	Oct '09	Nov '09	Dec '09	Jan '10	Feb '10	Mar '10	April '10	May '10	June '10	July '10	Sept '10
1JF	Start 1st Q	F2F R	Skype R	2nd Q	End	Interview						
2JM	Start 1st Q	F2F R Skype R	End	2nd Q		Interview						
3JM			Start	1st Q			F2F R	Skype R 2nd Q	End Interview			
4SM	Start 1st Q						Skype R	F2F R 2nd Q Interview			End	
5SM		Start 1st Q		F2F R Skype R	End	2nd Q		Interview				
6JF			Start	1st Q			F2F R Skype R	End	2nd Q Interview			
7JM			Start 1st Q	F2F R Skype R	2nd Q Interview			End				
8SM			Start 1st Q		F2F R Skype R	2nd Q Interview	End					
9IM				Start				1st Q	Skype R	F2F R	End 2nd Q	Interview (Mother)
10JF								Start 1st Q	Skype R	F2F R	End 2nd Q Interview	
11SF									Start 1st Q	SKYPE R	F2F R 2nd Q Interview	End

Key: Start = trial sessions began End = 10 trial sessions completed
(9) = the ninth session in the trial of ten
1st Q = 1st questionnaire sent to adults for completion 2nd Q = 2nd questionnaire sent to adults for completion
F2F R = F2F session video-recorded Skype R = Skype session recorded using Snap Pro 3 programme

Table 27: Schedule of data collection

4.5.1 Session Profile, Questionnaire and Interview Measures Data Collection

A total of 110 session profiles were completed. Each session profile was recorded within 24 hours of the session taking place whether F2F or Skype session. The session profile ratings for the ten trial sessions for each participant were set out in an excel spreadsheet with the costs to provide every trial session; this can be seen in Appendix 17. The costs to provide the trial sessions were separated from the session profile data and put into an additional excel spreadsheet; the 60 minute sessions were separated from the 30 minute sessions and this spreadsheet can be seen in Appendix 18. Twelve adult participants completed 24 questionnaires. A parent of each of the 11 child participants completed questionnaires but 5SM had Skype and F2F Speech and Language Therapy sessions supported by his Learning Support Assistant (LSA) as well as his mother so both the LSA and his mother completed the questionnaires. Adult respondents were given the same participant code as their child, but to distinguish between the parent and LSA questionnaire data for 5SM, the LSA was referred to as 5SM-P. The pre and post trial questionnaire response ratings for views on the technology, interaction and clinical activity are set out in Appendix 19. The adult expanded comments from the pre and post trial questionnaires are set out in Appendix 20 and Appendix 21 respectively.

Questionnaire responses were coded and entered into an Excel spreadsheet. For each adult, ratings of their computer competence, their pre and post trial views about the technology, and the quality of interaction and clinical activity in the Skype Speech and Language Therapy sessions were calculated.

Ten of the 11 children were interviewed: the youngest – 9IM – was not considered able to answer the questions reliably by both his mother and the research therapist because his attention span was so short and his understanding not adequate for the questions; his mother was interviewed in his place using the same questions; she

provided answers based on her observations of 9IM and his behaviour during the sessions. Her responses on behalf of 9IM were not included in the child interview data but were used as feedback to improve the Skype Speech and Language Therapy service.

For the majority – 2JM, 3JM, 4SM, 5SM, 6JF, 8SM, 10JF and 11SF – the interview took place immediately after a therapy session. For 1JF and 7JM an additional visit for the interview was arranged. One of the ten participants was interviewed using Skype (10JF) whilst the rest were interviewed face-to-face. Four of the participants were interviewed without an adult present; 5SM was interviewed at school with his LSA present whilst the rest were interviewed at their home.

All the children were asked if they would consent to a recording being made of the interview and six agreed to an audio recording – 1JF, 3JM, 4SM, 6JF, 7JM and 8SM - whilst the four others preferred that the research therapist wrote down their answers – 2JM, 5SM, 10JF and 11SF. Table 28 sets out the interview format parameters for the main study participants.

Participant	Parent Present	F2F	Skype	Dictaphone	Notes
1JF	✓	✓		✓	
2JM		✓		✓	
3JM	✓	✓			✓
4SM		✓		✓	
5SM	LSA present	✓			✓
6JF		✓		✓	
7JM	✓	✓		✓	
8SM	✓	✓		✓	
9IM	Mother interviewed using the same questions				
10JF	✓		✓		✓
11SF		✓			✓

Table 28: Interview format parameters for participants

The interview responses were first transcribed and then responses coded onto an Excel spreadsheet. Ratings for each of the five question areas – computer competence, technology, interaction, session activities, and general acceptance of the Skype Speech

and Language Therapy session format – were worked out for each participant. The ratings in response to the questions were combined to provide an acceptability of the Skype Speech and Language Therapy sessions for each participant. The analysis of the interviews will be presented alongside that of the video recordings. The full set of ratings for the interview data is set out in Appendix 22 and the expanded comments from the children are set out in Appendix 23.

4.5.2 Interaction Measure Data Collection

Recordings of the F2F sessions were made using a standard portable digital video-camera (Sony Handycam 2000X). The camera was positioned where the child felt most comfortable with it; this positioning meant that while the verbal exchange was complete the camera did not always capture facial expression or other non-verbal communicative behaviour in the recording. Following recording, the video was transferred to an individual DVD that could then be played on a laptop computer.

The Skype Speech and Language Therapy session video recordings were made using the SNAP Pro3 computer programme, with the audio and visual input and output recorded directly onto the Speech and Language Therapy service computer during the session and then burned onto an individual DVD that could be played on a laptop computer.

For all eleven participants, complete video recordings of one F2F and one Skype session were made after four Skype sessions had taken place. The 22 sessions recorded came to 16 hours; the complete list of the video recording data is set out in Table 29

Participant	Skype Session Length	F2F Session Length	Total Recording
1JF	60 minutes	60 minutes	2 hours
2JM	60 minutes	60 minutes	2 hours
3JM	60 minutes	60 minutes	2 hours
4SM	60 minutes	60 minutes	2 hours
5SM	60 minutes	60 minutes	2 hours
6JF	30 minutes	30 minutes	1 hour
7JM	30 minutes	30 minutes	1 hour
8SM	30 minutes	30 minutes	1 hour
9IM	30 minutes	30 minutes	1 hour
10JF	30 minutes	30 minutes	1 hour
11SF	30 minutes	30 minutes	1 hour
Total	8 hours	8 hours	16 hours

Table 29: Video recording data collected

Two graduates transcribed the recordings. For each video recording, transcription metadata i.e. who had transcribed, typed, checked, and coded the recording, was created. Appendix 24 sets out the transcription metadata for the video recordings.

The reliability of the transcription was checked by the research therapist, by transcribing five minutes of the video recording and then comparing the two versions; the check showed no differences except for three participants (6JF, 8SM and 9IM) where three differences were identified; first, when the child spoke quietly (6JF, 8SM), second, there were audio distortions in the Skype recording (8SM and 9IM) and third, when the child moved to another room away from the video camera (9IM).

One of the work experience graduates coded half of the transcripts whilst the research therapist coded the remainder. An inter-coder reliability check was then carried out. Ten percent of each transcript was selected at random and coded by the other coder; the two coders then compared the newly coded section with the original coding. The percentage of agreement was calculated; the coders then reviewed the script codings that differed between the two coders and discussed each point of difference, concluding either in agreement or no agreement. Subsequently a second percentage of agreement was calculated. This reliability process was repeated with a different part

of each transcript so that two further percentages of agreement were calculated. These reliability percentages are set out in Appendix 25.

The range of agreement in the first reliability check ranged from 74% to 98% for moves and 78% to 95% for utterance functions, with an averaged agreement percentage of 91% for moves and 89% for utterance functions. The required agreement percentage was set at 90%. At the second evaluation, agreement percentage ranged between 91% to 100% for moves and 95% to 100% for utterance functions - above the threshold ideal of 90%.

After the second coding reliability check had been carried out, the number of turns, utterances, words and interruptions were counted and also the different moves and utterance functions. A mean length of utterance (MLU) was also calculated by subtracting from the total words for that speaker, stalling (PS) utterances and the NSSE group of emotive utterances, and unintelligible utterances (Nunintell). For each participant these totals were entered in an individual Excel spreadsheet; the raw numerical data for each participant can be seen in full in Appendix 26.

The full responses from the questionnaires and interviews were also used to inform what further aspects of interaction could be examined. These observations included first, the children attending for longer in the Skype sessions second, differences in interaction when able to handle objects in the F2F sessions and third, the children communicating more in the Skype than the F2F session.

4.5.3 Data Storage

The session profiles, both questionnaires, interview recording and text transcription along with the DVD recordings were stored individually for each participant separately and kept in a locked filing cabinet. The video recording transcriptions for each recorded session were stored in separate folders and kept in a box in a locked office.

Chapter 5 Results

The results from the session profiles, questionnaires, interviews and discourse analysis are reported in this chapter.

5.1. Session Profile Results

The average data ratings of each aspect - clinical activity, technology, participation and cost – are set out in Table 30 for each participant along with a composite total. Each aspect is considered in turn.

Participant	Clinical Activity	Technology	Participation	Cost per minute	Cost Rating	Composite Total
1JF F2F	2.4	9.8	4	£2.28	2	18.2
Skype	2.8	7.0	4	£1.53	3	16.8
2JM F2F	2.33	9.0	4	£3.64	1	16.33
Skype	2.86	9.14	3.71	£1.64	3	18.71
3JM F2F	1.8	9.8	4	£2.97	2	17.4
Skype	2.4	8.4	3.8	£1.58	3	17.8
4SM F2F	2.0	10	4	£3.25	1	17
Skype	2.88	10	4	£1.73	3	19.88
5SM F2F	2.2	9.2	3.6	£2.86	2	17
Skype	2.4	9.4	3.8	£1.72	3	18.6
6JF F2F	2.0	10	4	£4.44	0	18
Skype	2.5	10	3.38	£1.89	3	18.88
7JM F2F	2.25	10	4	£3.34	1	17.25
Skype	2.0	9.0	4	£1.77	3	18
8SM F2F	1.00	10	4	£4.38	0	15
Skype	2.11	8.3	4	£2.14	2	16.44
9IM F2F	1.66	8.67	3.0	£3.24	1	14.34
Skype	2.42	7.43	4	£2.58	2	14.85
10JF F2F	2.5	10	3.0	£4.10	0	16
Skype	2.75	9.5	3.5	£2.08	2	17.25
11SF F2F	3.0	10	4	£3.69	1	18
Skype	3.0	8.56	4	£2.00	3	18.56

Key:

Clinical Activity Rating Scale Range = 0 to 3
Technology Rating Scale Range = 0 to 10
Participation Rating Scale Range = 0 to 4
Cost per Minute Rating
< that £2.00 = 3
£2.01 to £3.00 = 2
£3.01 to £4.00 = 1
>£4 = 0

Table 30: Session profile ratings for each participant

5.1.1 Clinical Activity

Figure 15 shows the acceptability rating of the clinical activity for each participant in both session formats. Clinical activity is the number of goals achieved in each session format – the higher the number of goals achieved in a session, the higher the rating score; the rating shown in the graph is the average rating for each participant in both session formats over the trial period of ten sessions. Figure 14 shows that for nine of the eleven participants the Skype sessions achieve a higher rating than the F2F sessions and for one (11SF) there was an equal rating for clinical activity in both session formats.

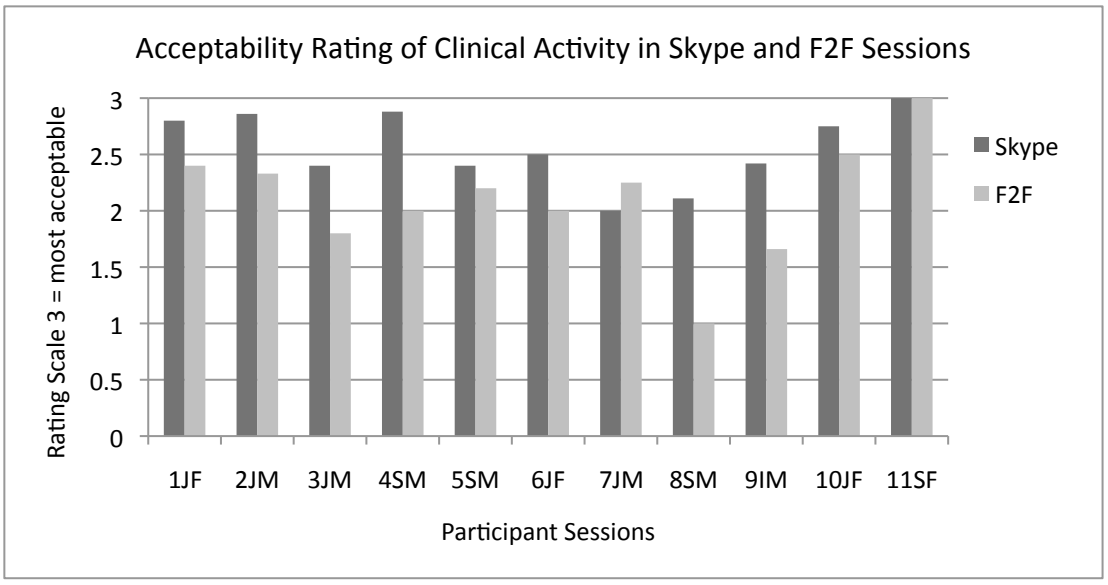

Figure 14: Acceptability Rating of Clinical Activity in Skype and F2F Sessions

The range of rating scores across participants for F2F clinical activity is wider than the Skype sessions - 1 to 3 – with an overall median rating of 2.2. The range of rating for the Skype sessions was slightly higher than the F2F range – 2 to 3 – with a median of 2.5.

5.1.2 Technology

Interruptions and other breaks in service were noted for the F2F sessions but in reality, the technology rating only applied to the Skype sessions. The technology ratings were made up of the number of interruptions i.e. breaks in the Skype connection as well as

the therapist rating of the visual and auditory clarity; the visual and audio rating scale is set out in Table 16 on page 110. Figure 15 shows the technology rating average for each participant in both session formats over the ten session trial.

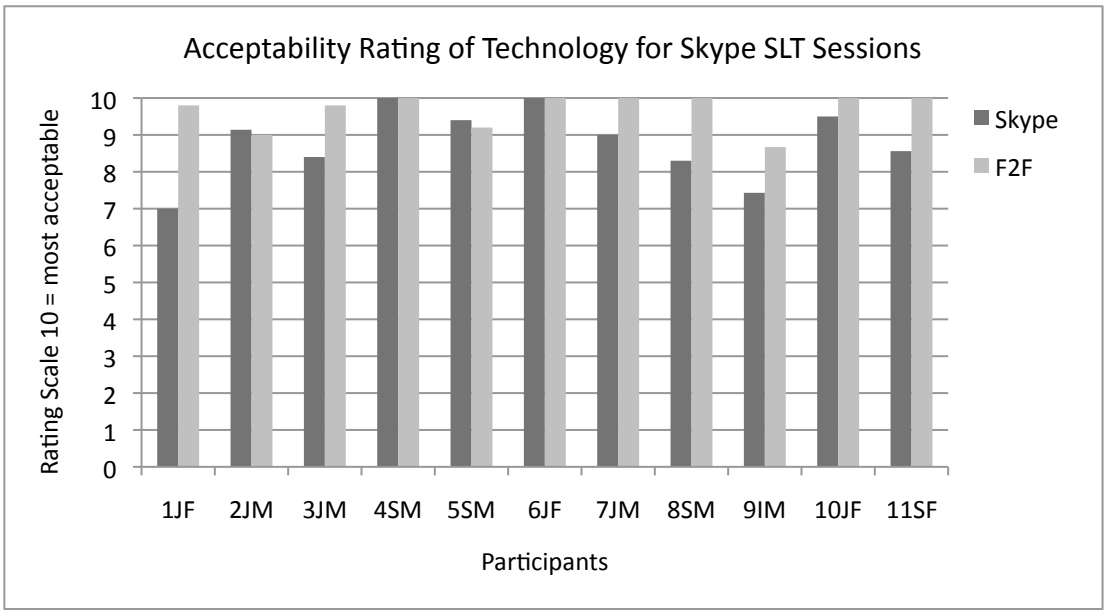

Figure 15: Acceptability Rating of the Technology for Skype Therapy Sessions

The Skype rating is not dissimilar to the F2F session rating; whilst 8.5 to 10 for F2F Speech and Language Therapy sessions, the Skype rating range was 7 to 10. For four participants (2JM, 4SM, 5SM and 6JF) the Skype and F2F ratings are very similar. The ratings for the F2F sessions lower than ten (2JM, 3JM, 5SM, 9IM) cannot be as a result of any loss of audio or visual clarity but rather the result of an interruption to the session. The two participants with the lowest Skype rating (1JF and 9IM) lived in rural locations and this may have affected their broadband download speed to access the internet and so the audio and visual quality was impaired; for both 1JF and 9IM, their pre session download speeds were recorded in some instances below 3500; however, the download speed for participants living and based in urban locations were in some instances lower – 6JF and 8SM – and yet the average rating of the technology was higher.

Table 31 sets out the range of download speeds recorded pre and post session for each participant. The low download speeds recorded did not seem to correspond with an increased number of connection breaks and therefore reduced acceptability rating

for the technology – 6JF and 8SM had the lowest download speeds but experienced no connection breaks throughout the whole trial. However, participant 11SF had the highest number of connection breaks and yet the download speeds recorded pre and post the sessions were above 5000 and higher than some of the other participants.

Participant	Urban or Rural	Pre Session range Download speed	Post session range Download speed	Total number of connection breaks
1JF	Rural	3285 -7046	1149 – 6680	3
2JM	Urban	3630 – 6195	938 – 5418	18
3JM	Urban	5919 – 6919	3687 – 6835	11
4SM	Rural	5033 – 6938	2156 – 6787	8
5SM	Rural	6470 – 7093	6418 – 7-49	None
6JF	Urban	2844 – 7000	2142 – 7061	None
7JM	Urban	4195 – 6803	1763 – 6812	None
8SM	Urban	1174 – 6896	2162 – 6532	None
9IM	Rural	2537 – 6906	6048 – 6929	3
10JF	Urban	6073 – 7061	5807 – 7009	1
11SM	Rural	5350 – 6983	6675 – 7053	28

Table 31: Download speed pre and post for each participant Skype sessions

5.1.3 Participation

The participation ratings in Table 30 on page 138 show similar ratings for all the participants in both session formats with no rating for either session format lower than three. Participation was rated by the therapist from the child's behavioural state throughout the session but also whether they expressed being at ease and if they had been able to say what they wanted to the therapist when asked at the end of the session. Two participants - 9IM and 10JF - had lower participation ratings in the F2F session than their Skype sessions; the parents of these participants reported in their questionnaires that they felt that their children were better focused in the Skype than the F2F sessions. The range of rating scores for all participants in the F2F sessions was three to four whilst for the Skype sessions there was a smaller range of 3.4 to 4; the mode for both the F2F and Skype sessions is 4; the median for the F2F sessions was 4 and for Skype was 3.8.

5.1.4 Cost

The cost rating was based on the actual cost to provide a minute of Speech and Language Therapy whether through Skype or F2F; these are set out for each participant in Figure 16. The average cost per minute to provide Speech and Language Therapy sessions was consistently higher for the F2F session format than for the equivalent Skype Speech and Language Therapy session. The cost range for 60 minute F2F sessions was £2.28 to £3.64 and for the 60 minute Skype sessions £1.53 to £1.73; the cost range for the 30 minute F2F sessions was £3.25 to £4.44 and for the 30 minute Skype sessions £1.77 to £2.14. The cost acceptability rating formed the fourth part of the composite rating for the session acceptability and had a range of 0 up to 3. The acceptability rating range for F2F sessions was 0 to 2 whilst for Skype sessions was 2 to 3.

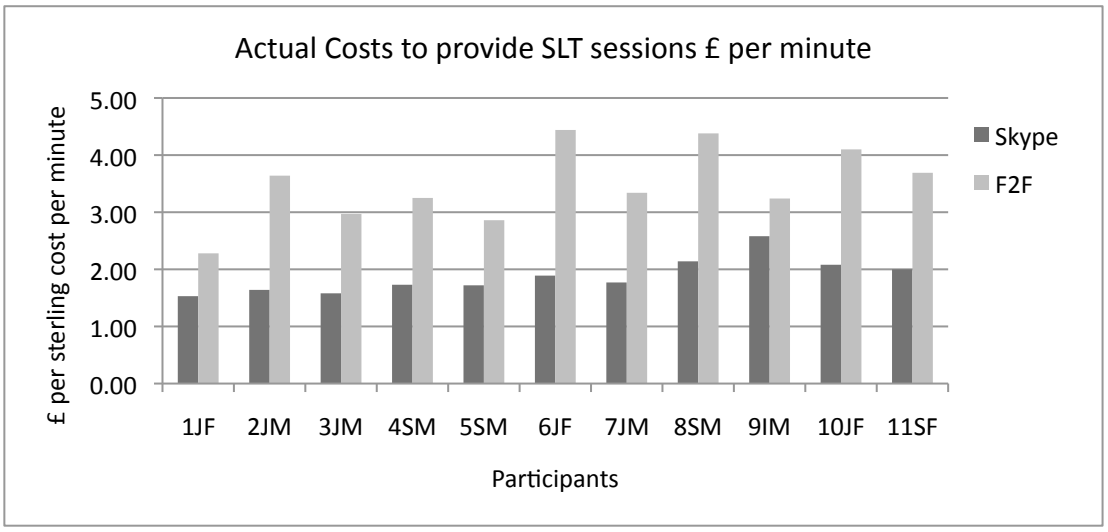

Figure 16: Cost per minute to provide Skype and F2F Therapy Sessions (£ per minute)

The cost acceptability presumes that the lower the cost to provide Speech and Language Therapy per minute, the more acceptable the cost will be and as can be seen in Figure 17; a reduced cost means in reality that less time has been used to facilitate the Skype session to happen although the actual session will have been the same length of time as the F2F equivalent. For eight of the participants (1JF, 2JM, 3JM, 4SM, 5SM, 6JF, 7JM, 11SF) costs to provide their Speech and Language Therapy session through Skype were £2.00 or less per minute and achieved a Skype rating of 3; five of

these participants (1JF, 2JM, 3JM, 4SM and 5SM) had sessions lasting 60 minutes. None of the F2F sessions in the trial were provided at a cost per minute as low as £2.

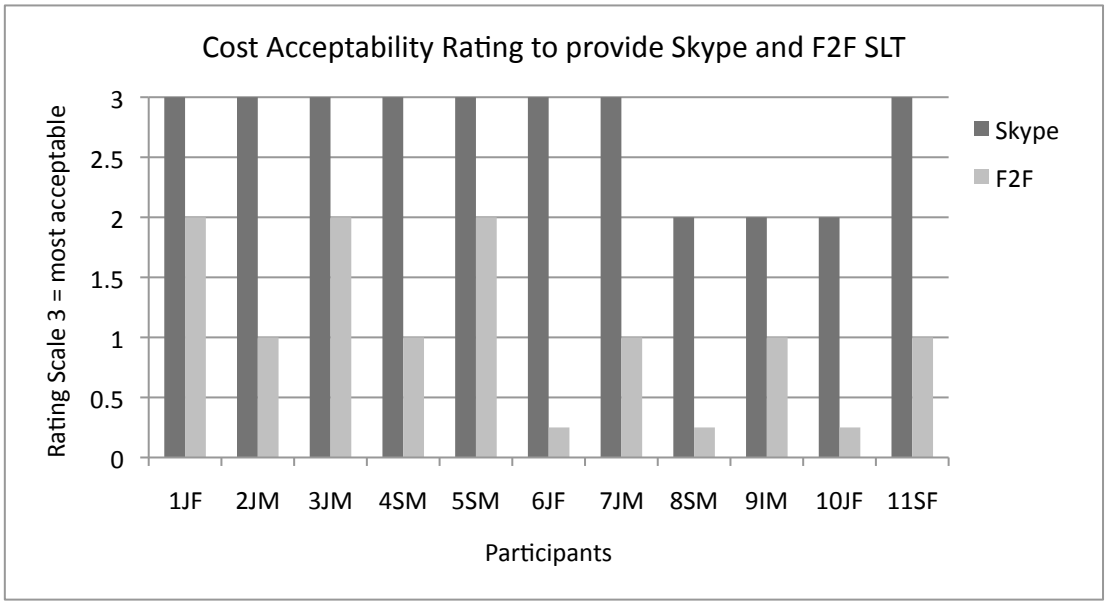

Figure 17: Cost Acceptability Rating to provide Skype and F2F Therapy

Finally the four ratings for clinical activity, technology, participation and cost were added together for each participant and are set out in Figure 18. Overall the acceptability rating of the trial Speech and Language Therapy sessions is higher for the Skype sessions. However, there is minimal difference between the session formats with a range of acceptability ratings for the Skype sessions of 14.85 to 19.88 and for the F2F sessions 14.34 to 18.2. With similar ratings for the two session formats, the Skype sessions could be considered acceptable because there is no difference from the F2F session.

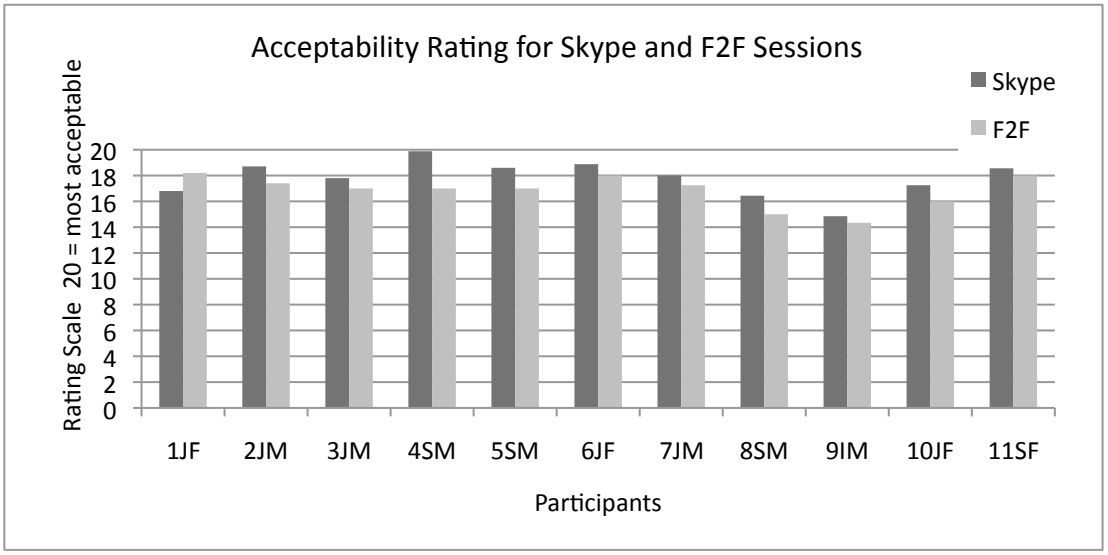

Figure 18: Acceptability Rating for Skype and F2F Sessions

5.2 Questionnaire Results

The complete Excel spreadsheet of each adult participant's questionnaire responses for computer competence, pre and post trial views on the Skype Speech and Language Therapy management can be seen in Appendix 19. The expanded views of the adults written in the pre trial questionnaire are set out in Appendix 20 and those from the post trial questionnaire in Appendix 21.

5.2.1 Computer Competence

Figure 19 sets out the computer competence rating for the adults supporting the child participants. For 5SM, two adults each completed a questionnaire; 5SM–P is the LSA who supported him in the Skype and F2F sessions at his school while 5SM is his mother who supported him in the F2F and Skype sessions based at his home.

The range of computer competency was zero to eight. For the adult participants in this research, the median rating for computer competence was 4.5 and the mode five. Those adults with a rating of seven or eight were considered the most competent computer users – 1JF, 4SM and 10JF. Those with a moderate competency rating had a score greater than two but less than seven; the majority of the supporting adults were in this group – 3JM, 5SM, 6JF, 7JM, 9IM and 11SF. Three participants had a rating two

or less and were considered least computer competent – participants 2JM, 5SM-P and 8SM.

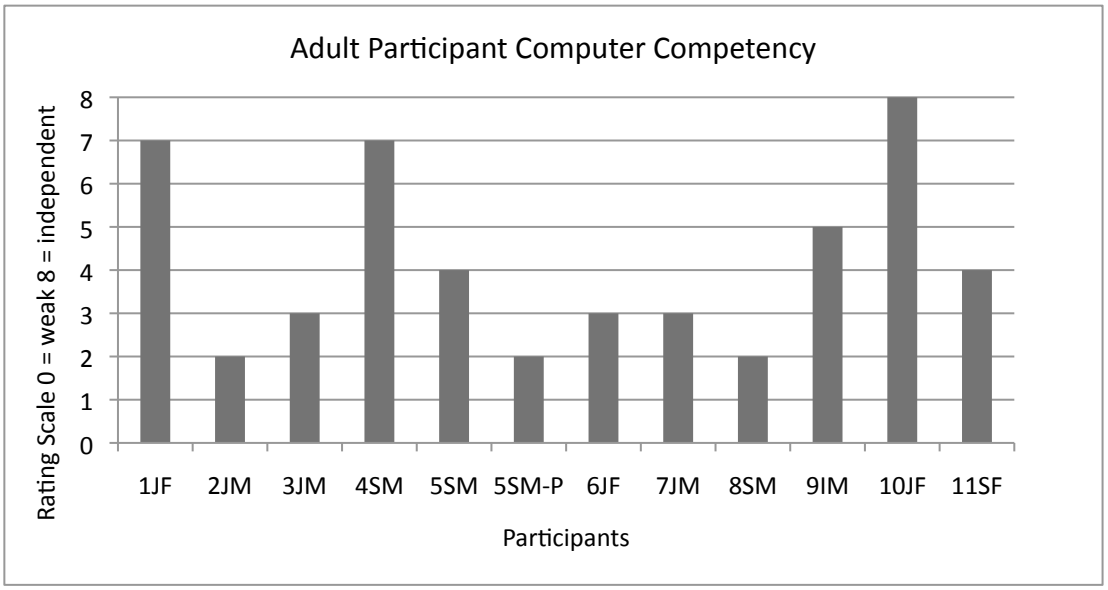

Figure 19: Adult Participant Computer Competency

One anxiety raised by the therapists in ASHA's survey (2002) was the management of the video-conferencing link with those at the remote end not familiar with computers or restricted by their language impairment. With this in mind, and whilst only three adult participants – 2JM, 5SM-P and 8SM - had a rating of least computer competent, their responses to other parts of the questionnaire were evaluated individually to identify any differences from the whole group.

5.2.2 Pre and Post Views of Skype Therapy

The pre and post Skype views of all twelve adults are set out in Table 32. The table shows pre and post ratings of the technology, the interaction and clinical sessions for each adult participant along with the combined rating of their pre and post ratings. The numerical ratings are placed in one of three groups – most accepting, accepting and least accepting - and these values are listed alongside the numerical rating.

Participant	Technology (out of 8)		Interaction (out of 14)		Clinical Activity (out of 20)		Combined (out of 42)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1JF	8 Most	8 Most	11 Most	13 Most	16 Most	20 Most	35 Most	41 Most
2JM	4 Mid	8 Most	9 Mid	11 Most	15 Mid	17 Most	28 Mid	36 Most
3JM	8 Most	5 Mid	13 Most	10 Mid	17 Most	14 Mid	38 Most	29 Mid
4SM	5 Mid	7 Most	3 Least	13 Most	17 Mid	14 Mid	25 Mid	34 Most
5SM	3 Mid	8 Most	8 Mid	14 Most	15 Mid	18 Most	26 Mid	40 Most
5SM-P	5 Mid	5 Mid	6 Mid	6 Mid	15 Mid	9 Mid	26 Mid	20 Mid
6JF	7 Most	8 Most	14 Most	14 Most	19 Most	19 Most	40 Most	41 Most
7JM	5 Mid	6 Mid	7 Mid	8 Mid	11 Mid	16 Most	23 Mid	30 Mid
8SM	7 Most	7 Most	14 Most	14 Most	20 Most	18 Most	41 Most	39 Most
9IM	6 Mid	8 Most	9 Mid	14 Most	17 Mid	19 Most	32 Most	41 Most
10JF	8 Most	7 Most	10 Mid	9 Mid	13 Mid	10 Mid	31 Mid	26 Mid
11SF	6 Mid	7 Most	8 Mid	14 Most	18 Most	19 Most	32 Most	40 Most

Key: Pre = pre Skype trial questionnaire Post = post Skype trial questionnaire

	Most = most accepting	Mid = accepting but less so	Least = least accepting
Technology	= 7 to 8	= 2 to 6	= 0 to 1
Interaction	= 11 to 14	= 4 to 10	= 0 to 3
Sessions	= 16 to 20	= 5 to 15	= 0 to 4
Total	= 32 to 42	= 11 to 30	= 0 to 10

Table 32: Main study adult pre and post ratings of the Skype therapy sessions

Combined scores are presented also in Figure 20. A shift can be seen in the views of the adults. For eight participants, their post trial rating was greater than their first rating – 1JF, 2JM, 4SM, 5SM, 6JF, 7JM 9IM and 11SF. One of the three least competent adult participants (2JM) shifted their view of the Skype sessions towards greater acceptance whilst the other two (5SM-P and 8SM) shifted their view towards less accepting. The numerical shift in the adult participant acceptance did not necessarily mean a shift to another level of acceptance; 8SM whilst showing less acceptance in the post trial questionnaire responses, still had an acceptance rating of 39, which placed their rating in the highest level of acceptance.

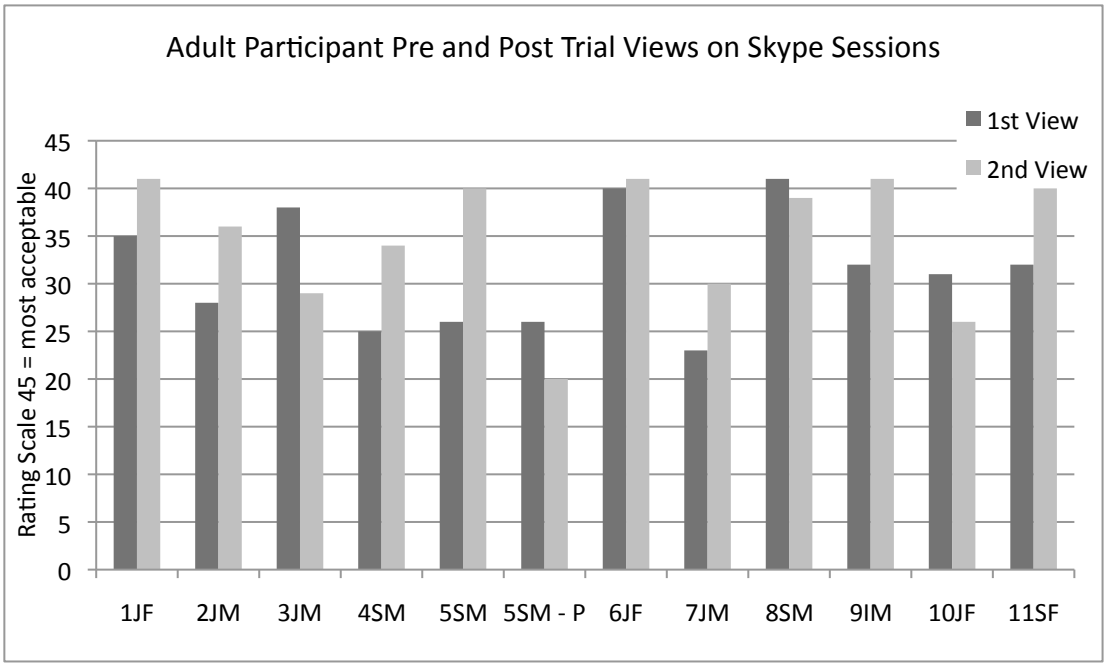

Figure 20: Adult Participant pre and post trial views on Skype Sessions (combined)

The Wilcoxon Test was used (Pring, 2005) to establish if there was any significant difference between the pre and post trial views of the adults for the clinical sessions, technology, interaction and general acceptance. Table 33 sets out the results from this statistical analysis.

	N value	W value	One tail test p<0.05	Two tail test p<0.05
Technology	9	4	8 = significant	5 = significant
Interaction	9	6.5	8 = significant	5
Clinical Activity	11	33.5	13	10
Combined	12	20.5	17	13

Table 33: Wilcoxon test results for acceptability of Skype sessions

5.2.3 Pre and Post Views on the Skype Technology

The technology acceptance ratings vary between the participants and are set out in Figure 21. With a maximum score of eight, participant scores ranged in the pre trial view from 3 to 8 with a median score of six and a mode shared between five and eight. In their post trial view, scores ranged from five to eight with a median of seven and mode of eight.

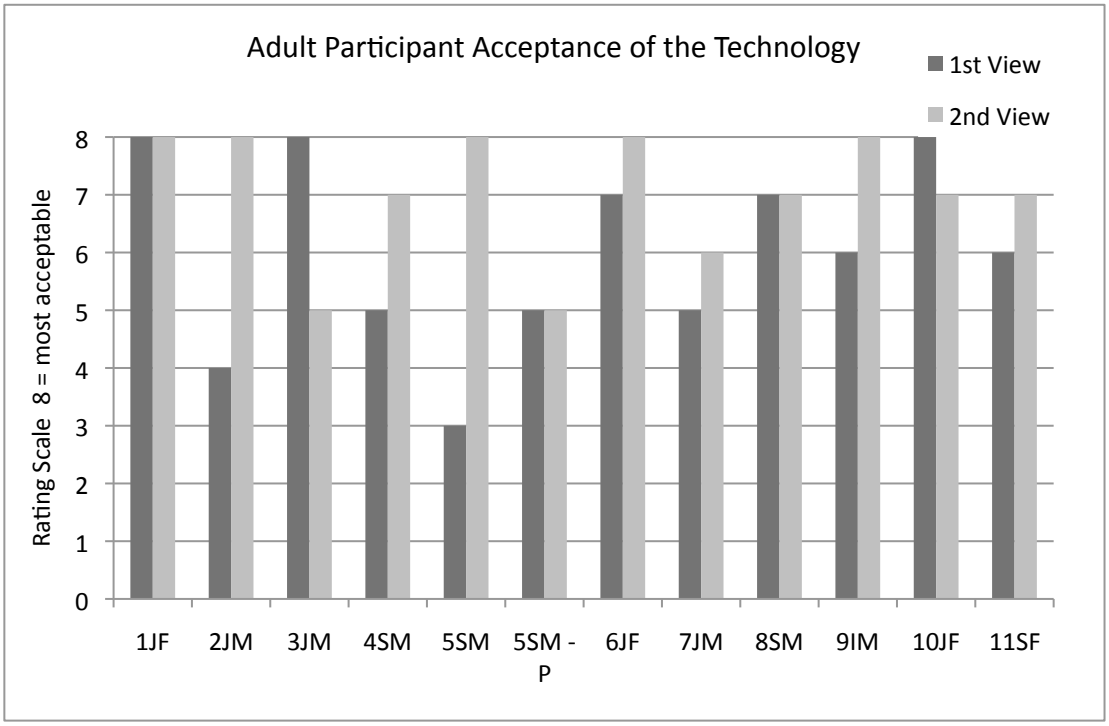

Figure 21: Adult Participant Acceptance of the Technology

Seven of the adult participants – 2JM, 4SM, 5SM, 6JF, 7JM, 9IM, 11SF – showed an increasing acceptance of the technology in their second rating; three participants achieved the same rating score in both questionnaires – 1JF, 5SM-P and 8SM; two – 3JM and 10JF – had a lower numerical rating suggesting less acceptance of the Skype technology with experience. Of the three least competent computer users, two showed no change in their rating between questionnaires – 5SM-P and 8SM – whilst 2JM did with more positive responses in their post trial questionnaire. A significant difference in scores was noted between pre and post views using the Wilcoxon Test.

5.2.4 Pre and Post Views on the Interaction in the Skype Therapy

Figure 22 shows a wide variation in the acceptance ratings of the Skype interaction during the Skype Speech and Language Therapy sessions. The pre trial adult ratings had a range of scores from 3 to 14 (the highest rating), a median of 9 and mode shared between eight, nine and fourteen. The range of post trial ratings was 6 to 14 with median of 13 and mode of 14. A significant difference was noted in scores pre and post views and is set out in Table 33. This suggests that the adults changed their view of the interaction in the Skype session, increasing their acceptance of the interaction in the Skype sessions with experience.

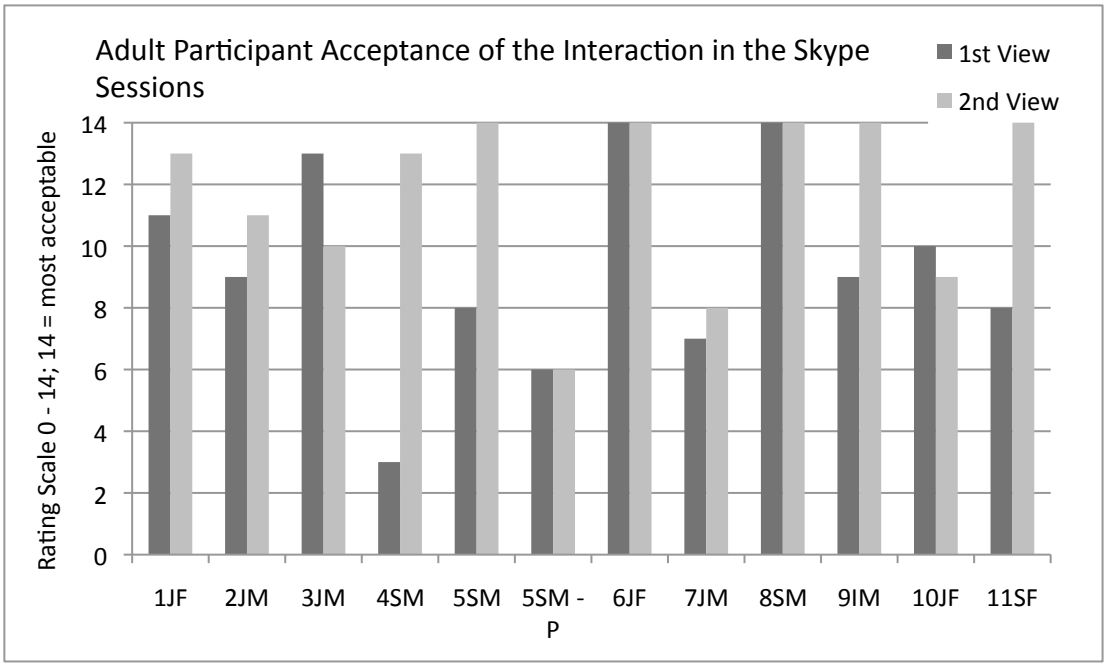

Figure 22: Adult Participant Acceptance of the Interaction in the Skype Sessions

Seven of the adult participants gave higher ratings of acceptance for the interaction in the Skype sessions in the second questionnaire - 1JF, 2JM, 4SM, 5SM, 7JM, 9IM and 11SF; for three – 5SM-P, 6JF and 8SM – there was no change in their acceptance rating; as with the technology acceptance rating, 3JM and 10JF showed a shift towards less acceptance of the interaction. Of the three least computer competent users, 5SM-P and 8SM did not change their rating with experience - 8SM's responses in both questionnaires fell into the most accepting group; 2JM's responses did shift towards increased acceptance.

5.2.5 Pre and Post Views on Clinical Activity

Figure 23 shows the range of acceptance that adult participants reported for the clinical activity in the pre and post trial questionnaires. With a maximum possible score of 20, participant pre trial acceptance ranged from 11 to 20 with a median of 16.5 and a mode shared between 15 and 17. In the post trial view, the range of ratings widened from 10 to 20 although the median and mode were higher – 18.5 and 19 respectively.

Five of the participants showed less acceptance of the clinical activities in their post trial questionnaire – 3JM, 4SM, 5SM-P, 8SM and 10JF. However, whilst 8SM showed a shift from 20 to 18, the rating was still most accepting; two of the other adults who showed less acceptance – 3JM, 4SM - had a rating in the mid range whilst the remaining two adults – 5SM-P and 10JF - had a substantially reduced acceptance of 9 and 10 respectively. The Wilcoxon test results set out in Table 33 (on page 147) indicated no significant statistical difference between pre and post views of the clinical activity.

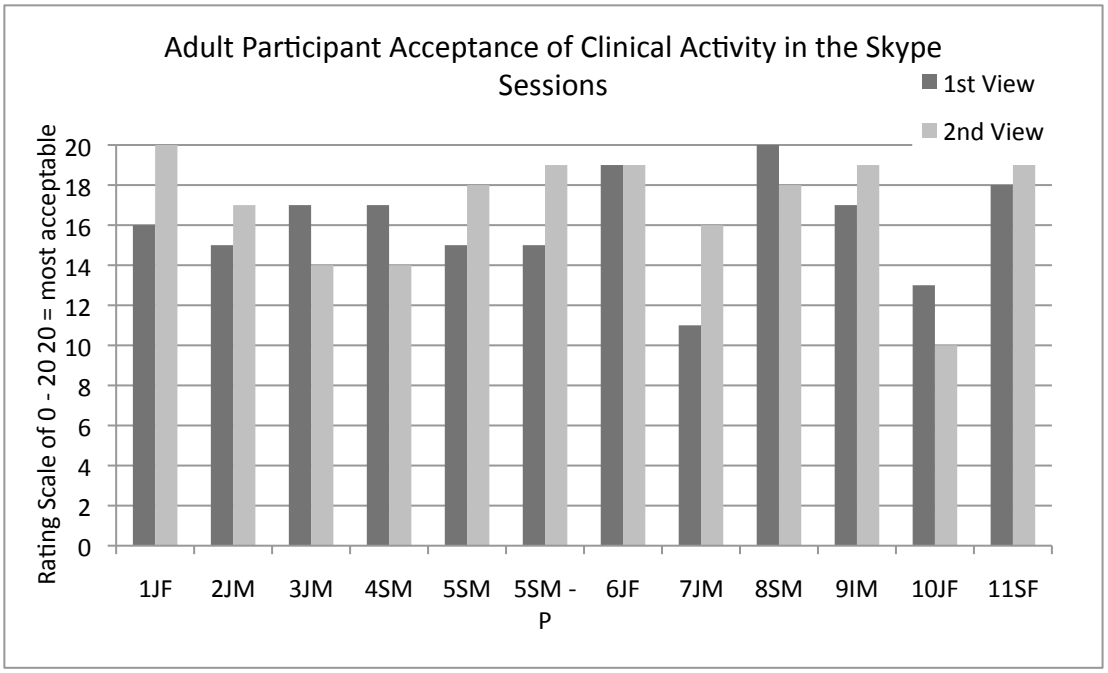

Figure 23: Adult Participant Acceptance of Clinical Activity in the Skype Sessions

For two of the three least computer competent users, 2JM and 8SM, their rating remained in the 'most acceptance' group; for 5SM-P, the shift with experience was again, as with the technology and interaction, towards less acceptance.

5.2.6 Acceptance of the Skype Therapy Sessions

Paritcipant views on the management of the Skype sessions and the technology were sought in the second questionnaire only; with no comparison to be made between pre and post views, the management aspects were not combined with the ratings for the technology, interaction and clinical activity. The ratings for the management of the Skype sessions had a maximum score of nine; there was a wide spread of scores for

the adult participants - from 2 to 9 with a median and mode of seven and is set out in Figure 24. The majority, eight of the twelve participants, had an acceptance rating for the management of the Skype Speech and Language Therapy of seven or greater – 1JF, 2JM, 4SM, 5SM, 6JF, 7JM, 8SM, and 9IM. Two of the adult participants – 5SM-P and 10JF – had low acceptance ratings of two and four respectively; these participants were the least and most competent computer users respectively. Two of the three least computer competent users - 2JM and 8SM – had ratings that were most accepting of managing the technology.

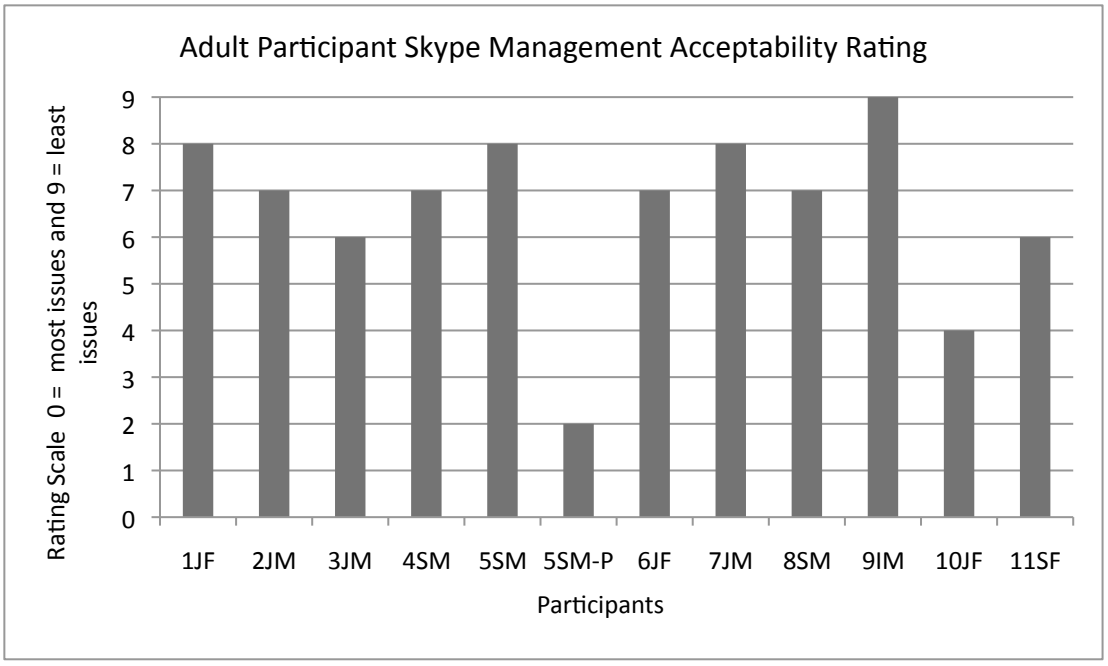

Figure 24: Adult Participant Skype Management Acceptability Rating

5.2.7 Expanded Questionnaire Answers

Themes emerged from the additional comments in the pre and post trial questionnaires. The complete range of comments from the pre and post trial questionnaires can be seen in Appendix 20 and Appendix 21 respectively.

The adults identified more benefits to Speech and Language Therapy service provided through Skype than drawbacks. These benefits included advantages for the therapist/service provider as well as the user i.e. the child/family. Table 34 sets out the list of predicted advantages alongside who had made the observation and who would benefit.

	Observation	Benefit	Participants
1	Less travel	Service	2JM, 4SM, 10JF
2	Less time wasted	Service	2JM, 8SM
3	Less school disturbance	Client	2JM, 6JF
4	Flexible i.e. any location	Client	5SM, 11SF,
5	Scheduling easier	Client and Service	8SM, 10JF
6	Reduced costs	Service and Client	4SM
7	Own environment	Client	5SM-P, 6JF, 8SM
8	More fun than the F2F sessions	Client	5SM-P, 8SM
9	More done in the time	Service	3JM, 8SM,
10	Be more involved in therapy	Client	6JF
11	Positive for auditory skills development	Client	11SF

Table 34: Predicted advantages of using Skype to provide therapy

The predicted advantages were linked equally to both the provider and client; fewer drawbacks were identified and these were all for the client and are set out in Table 35.

	Observation	Benefit	Participants
12	Hard to keep child focused	Client	4SM, 5SM, 5SM-P,
13	Stressful/anxieties to prep for session	Client	2JM, 3JM10JF
14	Interaction less fluid/disrupted	Client	4SM
15	Audio and visual distortion	Client	8SM
16	Less able to ask questions	Client	10JF

Table 35: Predicted disadvantages using Skype to provide therapy

The difficulties observed with the visual acuity in the sessions related to the size of the materials presented in the sessions and could be linked more generally to the loss of acceptability of the session materials and activities. The adults observed the child participants better able to keep focused and involved in the session activities (5SM, 7JM, 8SM, 9IM, 10JF); this observation was made despite drawbacks to the materials presented; this comment from 8SM's mother - 'some materials are not clear on the white board due to lighting however, he has understood the games and has not struggled to follow instructions' – illustrates the anomaly. A number of comments repeatedly remarked that the child enjoyed the Skype session; these included the mother of 6JF commenting 'the benefit for my child is that she is more relaxed about the Skype sessions and this makes it more favourable for her learning' and the mother of 10JF 'my child is very happy doing Skype and looks forward to them just as much as F2F'; by implication this may have supported the children and adults to keep their

attention on the screen and the Speech and Language Therapy activities (3JM, 4SM, 5SM, 6JF, 10JF).

Two of the adults - 8SM and 9IM - also observed that their child produced longer utterances in the Skype sessions. 8SM's mother commented that 'there has been a benefit in his language as he is attempting much longer sentences in his speech' and the mother of 9IM stated that '9IM seems to be communicating more in the Skype sessions than in the F2F sessions.'

In the post trial questionnaire, the adult participants provided comments that confirmed many of the predicted advantages and confounded disadvantages predicted in the pre trial questionnaire; these are set out in Table 36.

	Observation	Supported	Not supported
1	Less travel	2JM,	
2	Less time wasted	2JM, 5SM, 8SM,	
3	Less school disturbance	2JM,	
4	Flexible i.e. any location	4SM, 5SM, 8SM,	
5	Scheduling easier	8SM, 11SF	
6	Reduced costs	2JM	
7	Own environment	6JF,	
8	Fun	3JM, 4SM, 6JF, 8SM, 10JF	
9	More done in the time	2JM, 9IM	
10	Be more involved in Therapy	2JM,	
11	Positive for listening skills	5SM	
12	Hard to keep child focused		5SM, 7JM, 9IM, 10JF
13	Anxieties to prep session	2JM,	
14	Interaction less disrupted		2JM, 8SM, 9IM
15	Audio and visual distortion	2JM, 8SM	9IM
16	Less able to ask questions	10JF	3JM, 5SM

Table 36: Post trial questionnaire comments supporting predicted advantages and disadvantages

In the post trial questionnaire the management advantages that had been listed in the pre trial questionnaire were listed again. Whilst some anxiety had been raised in finding the time to prepare materials and support the actual sessions (2JM, 3JM, 10JF), others were able to identify a benefit to sitting in on the session that they did not do in the F2F sessions (2JM, 7JM). The mother of 2JM stated 'parent gets to see techniques and exercises as has to be present with Skype …….. so this facilitates carry over work'

whilst the father of 7JM reflected that he had 'purposely tried to avoid any assistance in order to push 7JM and I think the result was encouraging'.

5.3. Child Interview Results

The spreadsheet of each participant's responses to the interview questions can be seen in Appendix 22. Table 37 sets out the total score from the questions asked in each aspect covered in the interview; a total rating for that participant's acceptance of the Skype Speech and Language Therapy sessions was calculated from four of the five aspects covered in the interview – technology, interaction, activity and acceptance.

Child Participant	Competence (out of 8)	Technology (out of 8)	Interaction (out of 10)	Activity (out of 6)	Acceptance (out of 12)	Total (of 36)
1JF	4 average	4 mid	9 most	6 most	11 most	30 most
2JM	4 average	6 most	7 mid	6 most	11 most	30 most
3JM	5 average	7 most	8 most	5 most	10 most	29 most
4SM	5 average	8 most	9 most	4 mid	10 most	33 most
5SM	6 competent	8 most	6 mid	3 mid	10 most	27 most
6JF	4 average	8 most	8 most	5 most	11 most	32 most
7JM	4 average	6 most	8 most	5 most	11 most	30 most
8SM	5 average	4 mid	10 most	6 most	12 most	32 most
9IM	Not interviewed					
10JF	2 least	8 most	10 most	6 most	10 most	34 most
11SF	6 competent	8 most	8 most	5 most	10 most	31 most

Key:

Computer Competence Rating
Most competent = 7 to 8 Average = 2 to 6 Least competent = 0 to 1

	Most = most accepting	Mid = accepting but less so	Least = least accepting
Technology	= 6 to 8	= 3 to 5	= 0 to 2
Interaction	= 8 to 10	= 3 to 7	= 0 to 2
Sessions	= 5 to 6	= 2 to 4	= 0 to 1
Acceptance	= 10 to 12	= 3 to 9	= 0 to 2
Total	= 26 to 36	= 11 to 25	= 0 to 10

Table 37: Collated child participant interview responses

5.3.1 Child Participant Computer Competence

Figure 25 sets out the competency rating for each participant; out of a range of zero to eight, the child participants achieved a wide range of computer competence ratings - 2 to 6, with a median rating score of 3.5 and mode of 4. The majority of the children rated themselves as average with the two of the oldest (5SM and 11SF) rating themselves as most competent; the youngest participant interviewed had a rating of least competent (10JF).

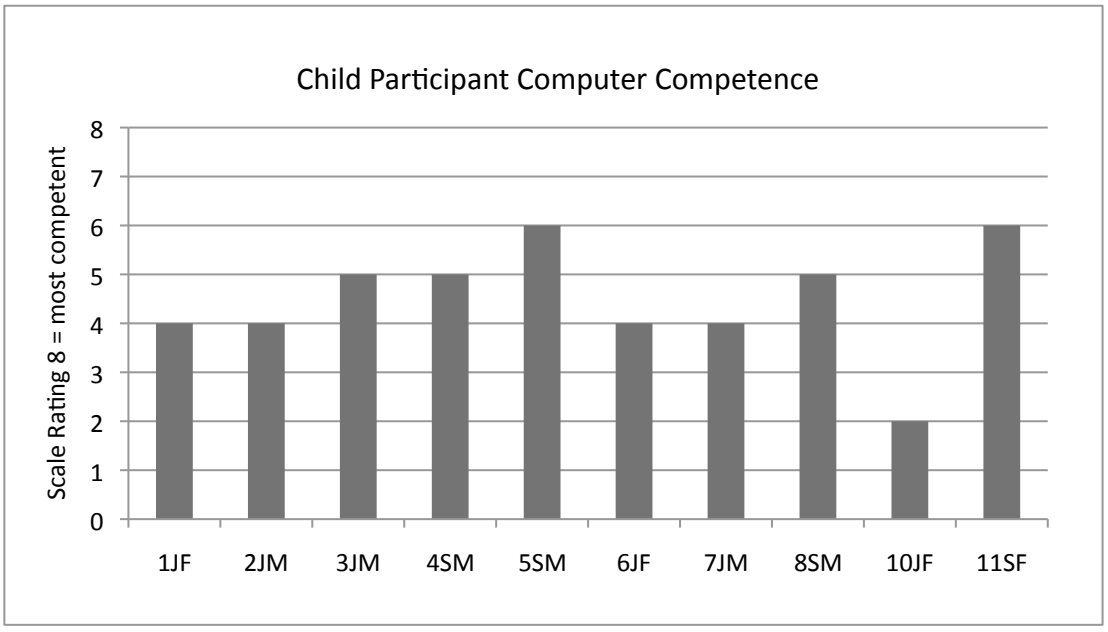

Figure 25: Child Participant Computer Competence

5.3.2 Child Participant Acceptance of the Skype Technology

Figure 26 shows the range of acceptance ratings for the technology; the range of rating scores was four to eight with a median of 7.5 and mode of eight. Six of the ten participants had a rating of greatest acceptance. Three of the four oldest children had the top acceptance rating of eight (4SM, 5SM and 11SF). The two participants who found the technology the least accepatble were the only participants that had goals focused on phonology (1JF and 8SM). Participant 10JF who was rated least computer competent was one of the participants who reported the highest acceptance rating.

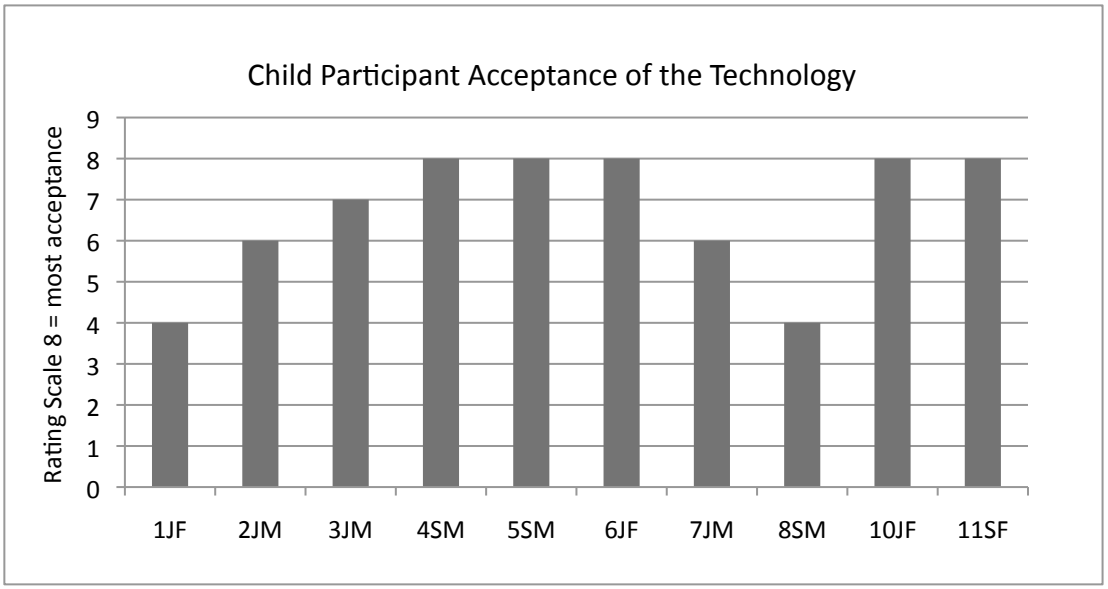

Figure 26: Child Participant Acceptance of the Technology

5.3.3 Child Participant Acceptance of the Interaction

The range of rating scores for acceptance of the interaction in the Skype Speech and Language Therapy sessions is set out in Figure 27. The full rating scale was zero to ten; the range of acceptance for the participants was between six and ten and the median and mode was eight.

Two participants had found the interaction less acceptable (2JM and 5SM) although they had found the technology acceptable; they were positive about the technology and offered no comments about talking and social interaction in the Skype sessions; both were quick to answer and reluctant to expand their answers even when encouraged. The least computer competent participant (10JF) had a high acceptance rating of the interaction.

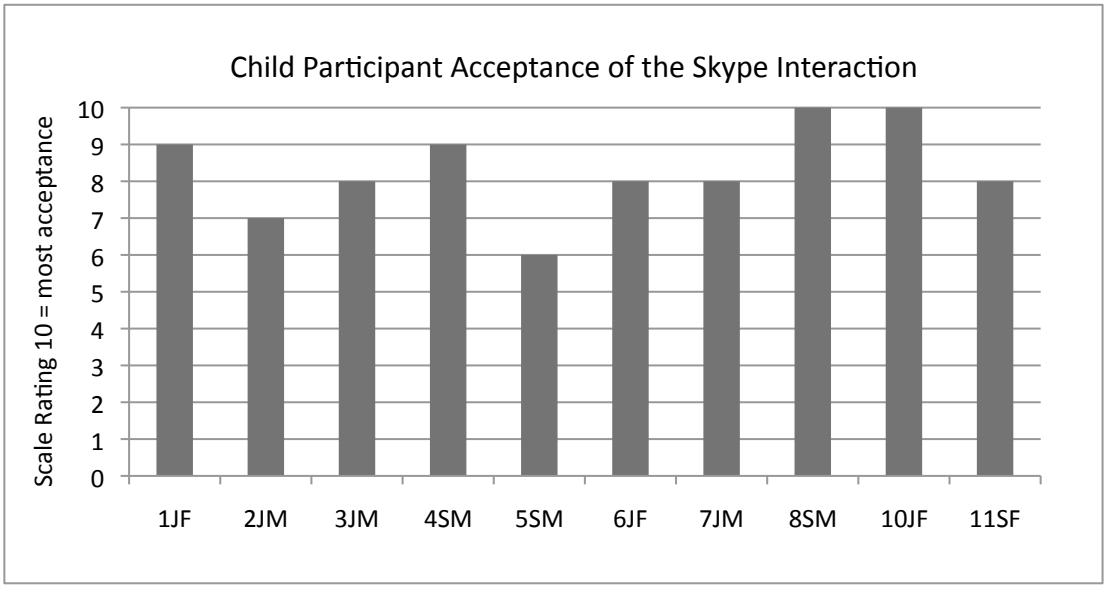

Figure 27: Child Participant Acceptance of the Skype Interaction

5.3.4 Child Participant Acceptance of the Clinical Activity

The participants had acceptance ratings from three to six with a median of five and mode shared between five and six that can be seen in Figure 28.

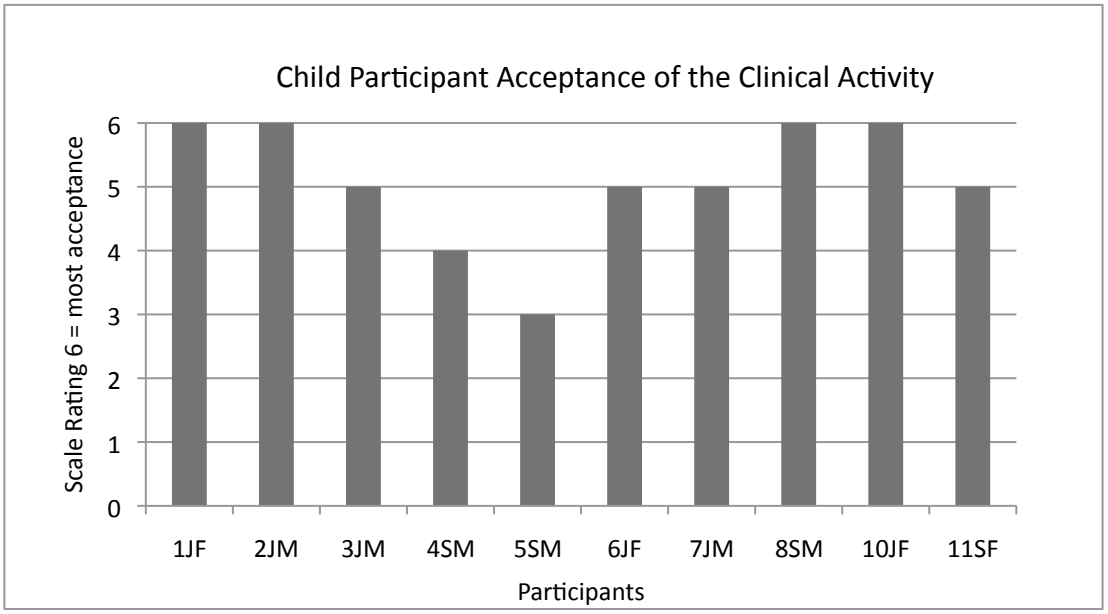

Figure 28: Child Participant Acceptance of the Clinical Activity

Those with the lowest acceptance ratings (4SM and 5SM) were both teenagers and both had a diagnosis of autism; 4SM observed that he had to 'work harder' in the Skype Speech and Language Therapy sessions whilst the LSA working with 5SM observed that 5SM's ability to respond could be variable and dependent on his mood –

'his (5SM) moods can change very fast especially if anything goes wrong'. The least computer competent participant 10JF again had a high acceptance rating of the clinical activity.

5.3.5 Child Participant Acceptance of the Skype Therapy

The participants interviewed had a range of rating scores for their acceptance of Skype Speech and Language Therapy sessions of 10 to 12 with a median of 10.5 and a mode of ten. Figure 29 shows that all the participants, including those that had not been so accepting of the technology (1JF and 8SM), interaction (2JM and 5SM) or clinical session activities (4SM and 5SM), had similar overall acceptance rating for the Skype Speech and Language Therapy sessions.

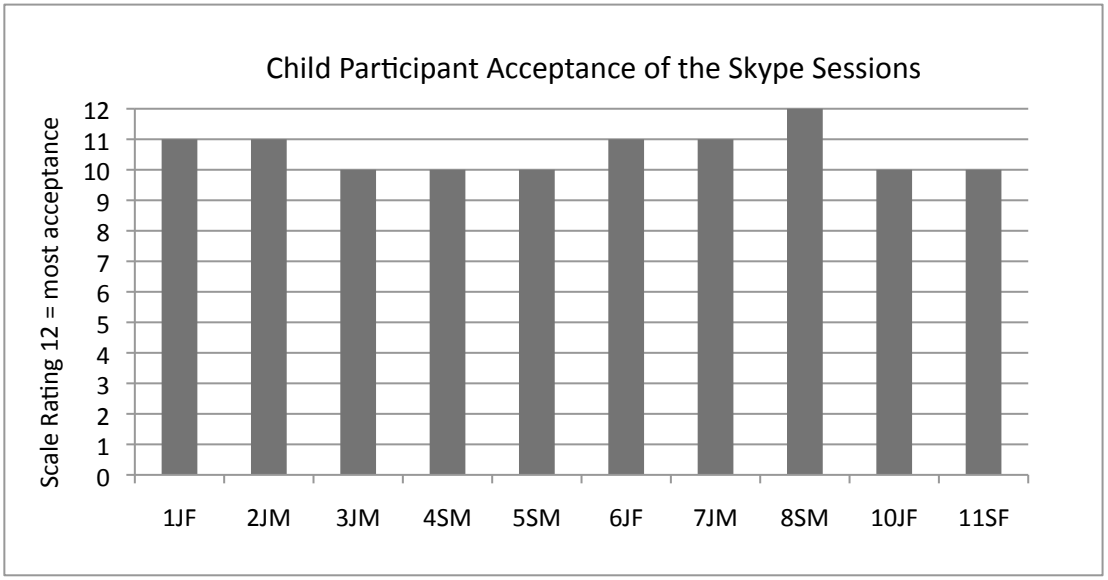

Figure 29: Child Participant Acceptance of Skype Sessions

5.3.6 Child Participant Expanded Interview Answers

The children were encouraged to expand and justify their answers and their complete responses can be seen in Appendix 23. There were additional observations that indicated that the visual acuity – fuzzy picture quality – and audio distortion needed to be improved (1JF and 7JM). They provided positive comments to support the use of Skype that could equally apply to any other video-conferencing system and these are listed in Table 38.

	Observation	Benefit Area	Participant
1	Prefer the certificate to the sticker	Clinical	3JM
2	Work harder	Clinical	4SM, 11SF
3	Don't have to tell friends about Speech and Language Therapy	Clinical	6JF
4	Have Mum and Dad in the session	Clinical	6JF
5	More things done	Clinical	8SM
6	Flexible	Service management	4SM, 8SM, 11SF

Table 38: Identified benefits to Skype Therapy by the child participants

The children identified a number of reasons that might make the Skype sessions more suitable than the F2F; these reasons included working harder, having parental support, less obvious to their peers, less anxiety scheduling the sessions. Among the advantages to F2F that emerged were being able to see the expressions of the therapist (11SF) as well as being able to talk for longer (11SF) and not having to prepare the materials for the session (6JF).

Session Activity	F2F preferred	Skype preferred	No Preference
Cluedo	8SM, 10JF	3JM, 4SM, 5SM	1JF, 6JF
Amy's Wardrobe		1JF	
Alert Listening/Colouring		1JF, 2JM, 6JF	
Guess Who?		2JM, 10JF	
Sudoku		4SM	
Debates		4SM	
Goblet Kid		7JM	
Mastermind		11SF	
Three of a Crime		11SF	
Penguin Pile Up		8SM	
Pass the Bomb	4SM		
Connect 4	7JM		
In Your Face	10JF		

Table 39: Child participant preferred session activities

A large part of the interview had focused on the activities that the participants had liked in both session formats and which were preferred in one format or the other. The preferences of the participants are set out in Table 39. When asked why particular activities were preferred in the F2F sessions, the common response was being able to handle the dice or playing pieces and manipulate them. Reasons provided for preferring the Skype Speech and Language Therapy activities included being able to 'boss the therapist' and less likelihood of any cheating.

5.4 Interaction Data Results

Analysis examined the three speaker groups – therapist, child participant and adult supporting - in the two different session formats to identify differences. Features that could reflect the adult and child participant observations were examined as were previous research observations that linked specific features of discourse to the quality of the technology, clinical activity time and interaction flow. The complete range of data for each participant can be seen in Appendix 27.

5.4.1 Comparison of the Speakers in F2F and Skype Therapy Session

The mean number of speaker turns and the range of moves was mirrored across both session formats for all three speakers and can be seen in Figures 30, 31 and 32 for the therapist, adults and child participants respectively.

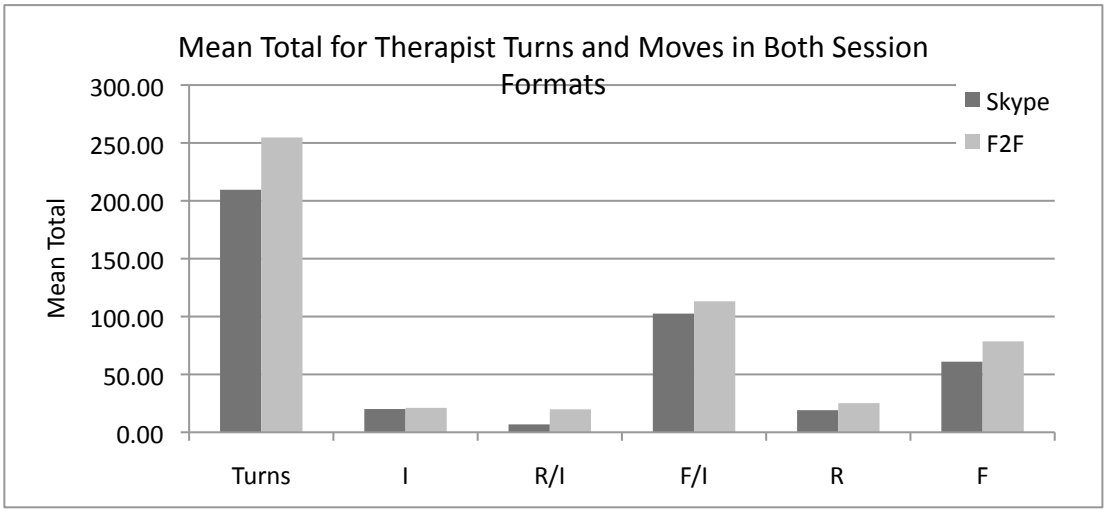

Figure 30: Mean Total for Therapist Turns and Moves in both session formats

Whilst the adult speakers spoke less than the therapist, the pattern in their moves reflected the therapist pattern with a peak of Follow up/Initiation (F/I) moves and more Follow up (F) moves than Response/Initiation (R/I) and Response (R) only moves.

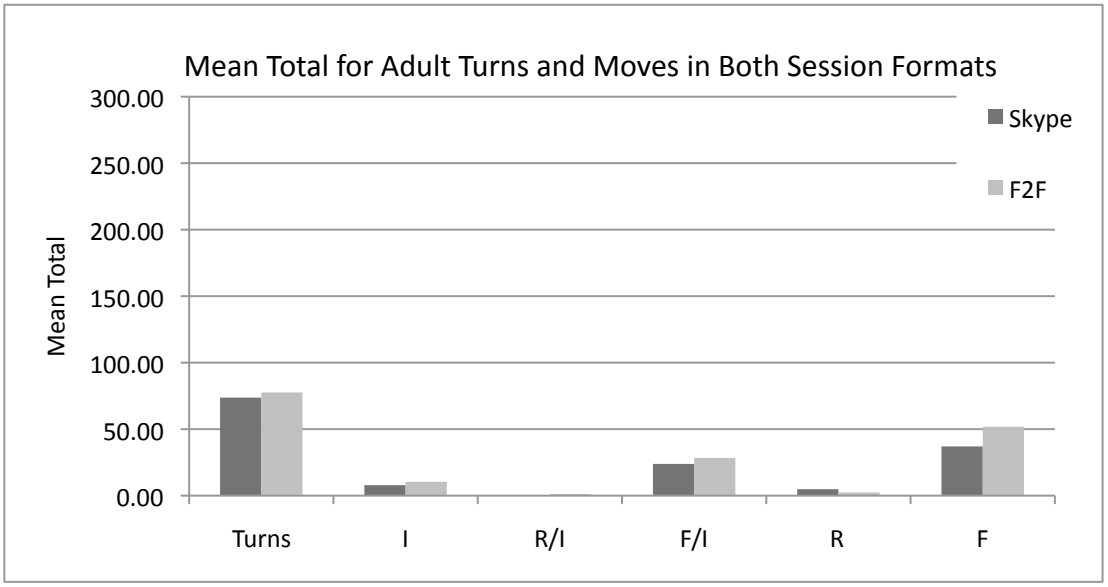

Figure 31: Mean Total for Adult Turns and Moves in both session formats

Whilst the pattern of turns and moves for the children was the same for the turns, initiations (I), response/initiation (R/I) and follow up/initiations (F/I) there were differences in their use of Response (R) only and Follow up (F) only moves in the two session formats.

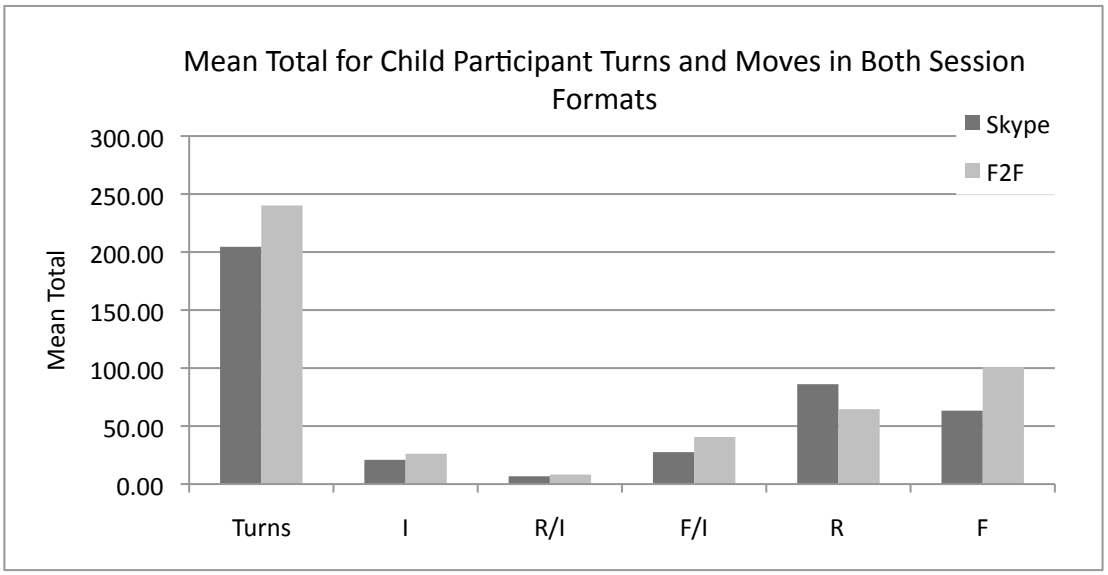

Figure 32: Mean Total for Child Participant Turns and Moves in both session formats

Figure 32 shows that the child participant used more response only (R) moves in the Skype session than the F2F session but more follow up (F) moves in the F2F session. Pearson's Chi square analysis, set out in Table 40, showed that this difference was above the level of chance.

		Chi Square	Df	P = 0.05	Significant
1	Child use of Response Moves in 2 sessions	61.675	1	<0.001	Yes
2	Child use of Follow up moves in 2 sessions	29.391	1	<0.001	Yes

Table 40: Chi square results for observed differences in child participant moves

Whilst the pattern of turns was distributed similarly between the participant and the therapist in both session formats, the therapist in both session formats produced the most utterances, reflecting observation from earlier research (Letts, 1985). All three speakers produced more utterances in the F2F format. The mean length of utterance (MLU) was calculated for each speaker group and is set out in Figure 33.

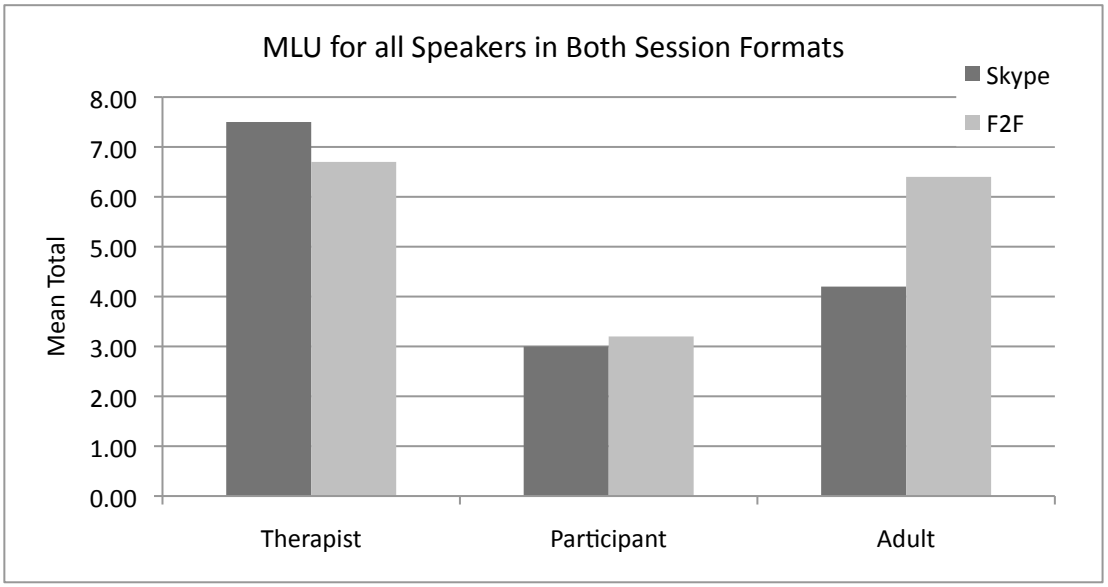

Figure 33: MLU for all Speakers in both session formats

The therapist had a similar MLU in both session formats as did the child participants; as expected the therapist had a longer MLU than the child; in keeping with observations from other research that health professionals have a longer MLU than patients in health services provided using tele-technology (Miller, 2010), the therapist in this research had slightly longer MLU in the Skype than in the F2F session.

The adult participants had a longer MLU in the F2F session and this might be considered necessary by the adults to support the child participants to remain focused in the F2F session; in the Skype session, the adults had a shorter MLU which could suggest that the children in the Skype sessions were better able to stay focused on the

therapist in the Skype session with less verbal support and prompts needed from the adult with them.

5.4.1.1 Use of Functions in F2F and Skype Sessions

The mean total of Requests, Providing and Other Group utterances used by the three speakers in both session formats are set out in Figures 34, 35 and 36. Utterances in the request group include requests for joint attention (RJA), information (RI), object or action (ROA) and clarification; those in the providing group include providing information (PI), prompts (PP), stalling (PS), feedback (PF) and clarification (PCrep) whilst those in the Other Group include emotional responses (NSSE), confirmation or denials (NCD), acknowledgements (NACK) and unintelligible utterances (Nunintell) that were still responded to by the other conversation partner.

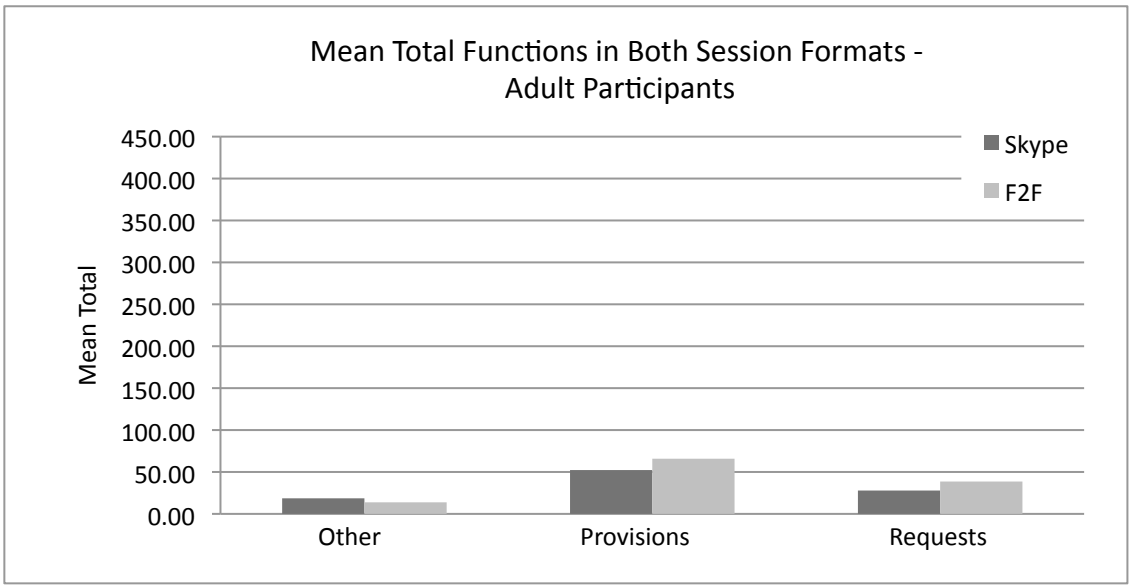

Figure 34: Mean Total for Utterance Functions in both session formats – Adult Participants

For all three speakers the same pattern of use was observed; the greatest number of utterances used were those with a Providing function, second were those that fell into the Request group and the fewest were those that fell into the Other group.

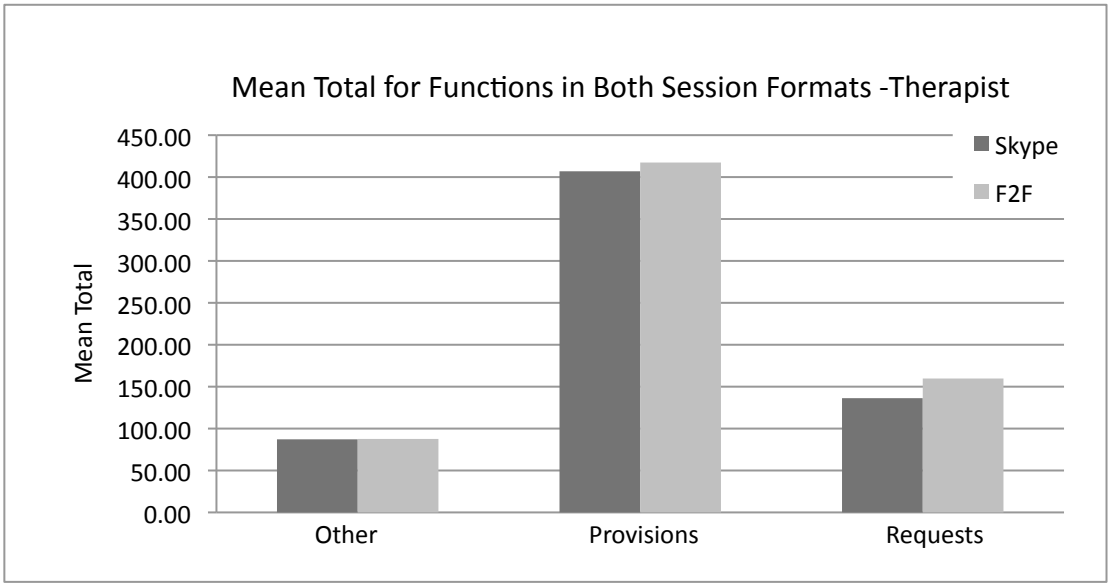

Figure 35: Mean Total for Utterance Functions in both session formats - Therapist

Whilst there was no observable difference for the therapist and child participants in their use of providing functions in both session formats, there was an observable increase in the number of request functions by the therapist and child in the F2F session format.

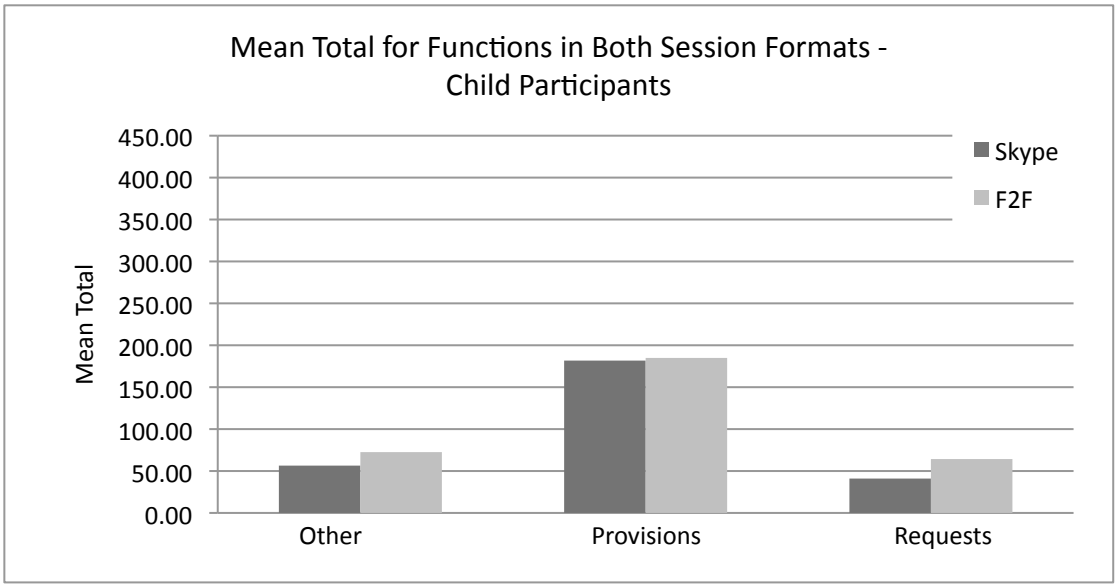

Figure 36: Mean Total for Functions in both session formats - Child Participants

Chi square analysis was carried out and the results are set out in Table 41. The statistical result highlighted a significant difference between the use of Requests and Other functions between session formats.

		Chi Square	Df	P = 0.05	Significant
1	Use of Providing utterances	0.45	1	0.832	No
2	Use of Request utterances	17.420	1	<0.001	Yes
3	Use of Other Group utterances	12.216	1	<0.001	Yes

Table 41: Chi square results for observed differences in therapist and child utterance functions

The discourse analysis distinguished five discrete types of providing utterances – providing information (PI), feedback (PF), prompts (PP), clarifications (PCrep/PCrev) and stalling utterances (PS). The overall pattern of use is similar but there are differences between the two contexts.

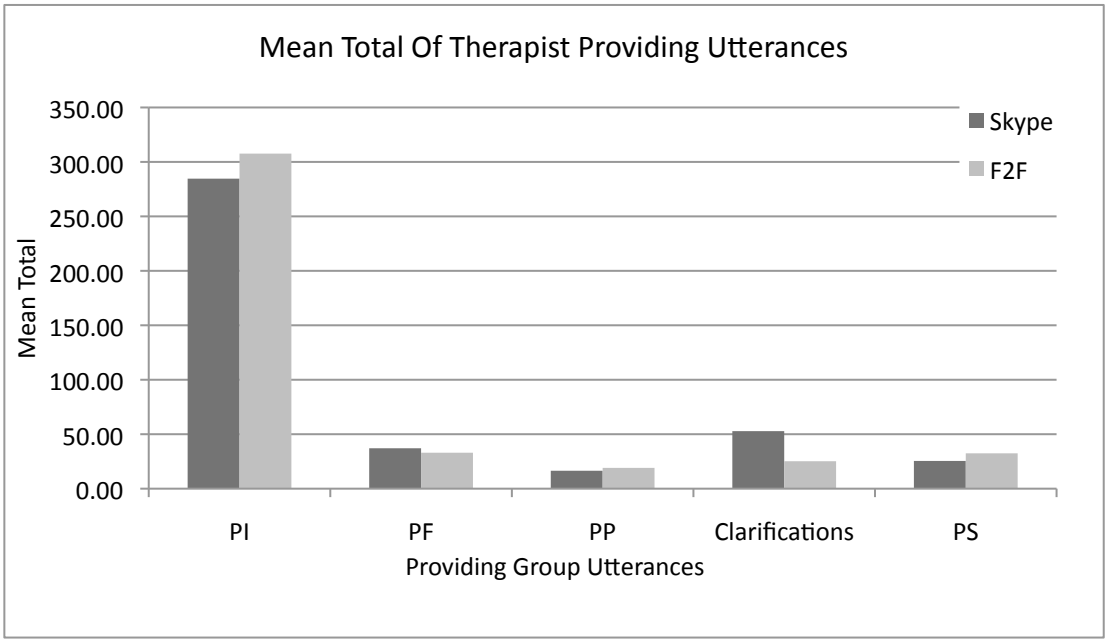

Figure 37: Mean Total of Therapist Providing Utterances

Both the therapist and the children used predominantly provision of information (PI) utterances with other providing utterances used less frequently. The distribution of providing utterances for the therapist and child are set out in Figures 37 and 38. The therapist used all five providing utterances whilst the child did not use any utterances that provided feedback (PF) or prompts (PP).

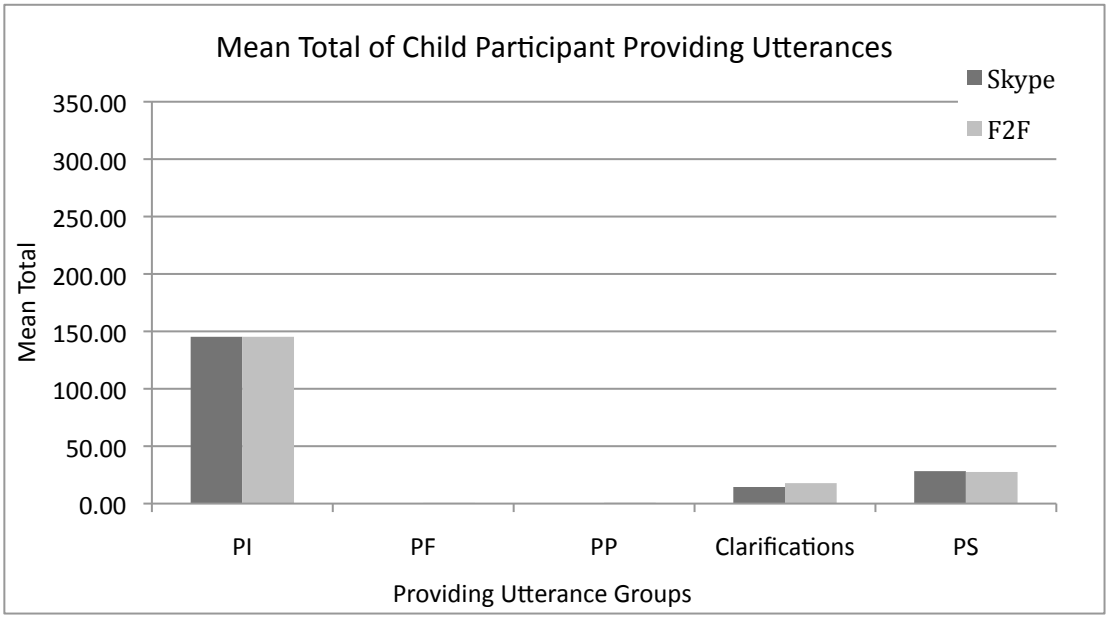

Figure 38: Mean Total of Child Participant Providing Utterances

The adult participants had a different pattern of providing utterances that can be seen in Figure 39; like the therapist and participant, they used providing information (PI) utterances predominantly but more prompts (PP) in the Skype than the F2F session.

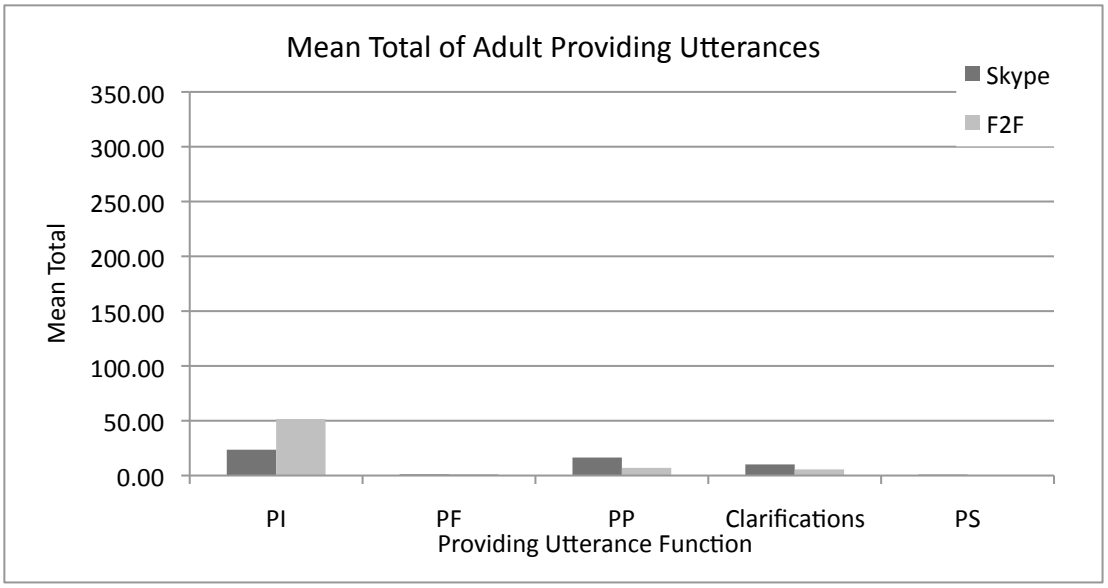

Figure 39: Mean Total of Adult Providing Utterances

Chi square analysis compared the therapist's use of providing information with clarifications in the two session formats. The adults' use of providing information and prompts were compared using Chi square and for both comparisons, the differences observed in the use of these utterances were shown to be above chance (Table 42).

		Chi Square	Df	P = 0.05	Significant
1	Therapist's use of providing information and Clarifications in both session formats	117.189	1	<0.001	Yes
2	Adult's use of providing information and prompts in both session formats	62.851	1	<0.001	Yes

Table 42: Chi square results for observed differences in speaker use of providing utterances

There were four distinguishable utterance functions within the request group – requesting information (RI), an object or action (ROA), request another's joint attention (RJA) and clarification (RC). The pattern of request utterance use for each speaker is set out in Figures 40, 41 and 42.

None of the speaker groups showed the same pattern of request utterance use in the Skype session as in the F2F session format. All three speakers used a more equal number of requests for objects and actions (ROA) with the requests for information (RI) in the F2F session format; however, the child and therapist used more information requests (RI) than requests for an object or action (ROA) in the Skype session.

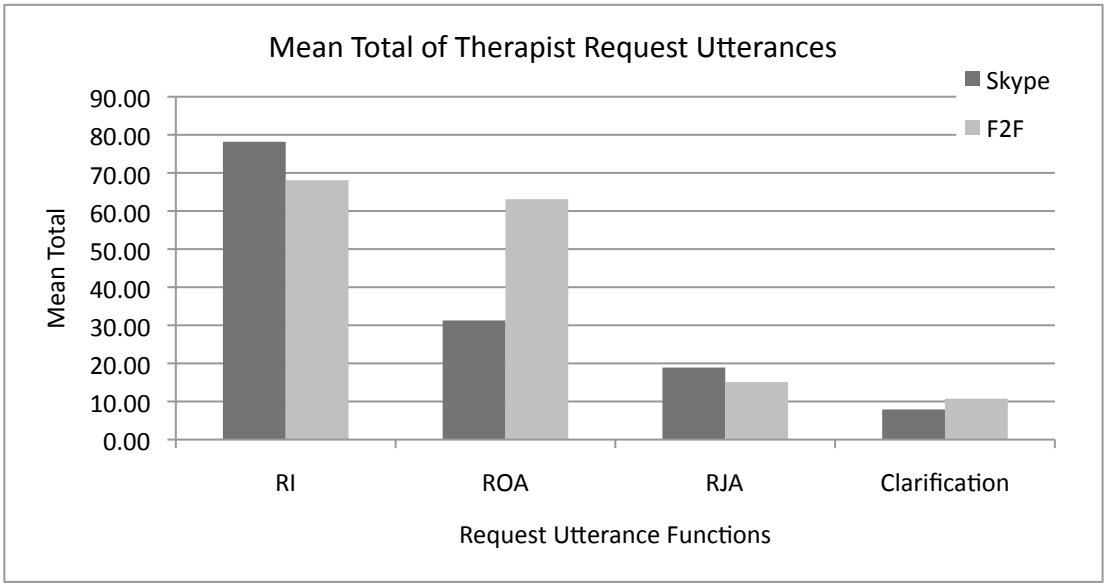

Figure 40: Mean Total of Therapist Request Utterances

Unlike the child participants who used no requests for joint attention (RJA), the therapist used more requests for joint attention (RJA) in the Skype than F2F session. The therapist made fewer requests for clarification in the Skype than F2F session, unlike the child participants who made more clarification requests in the Skype than the F2F session.

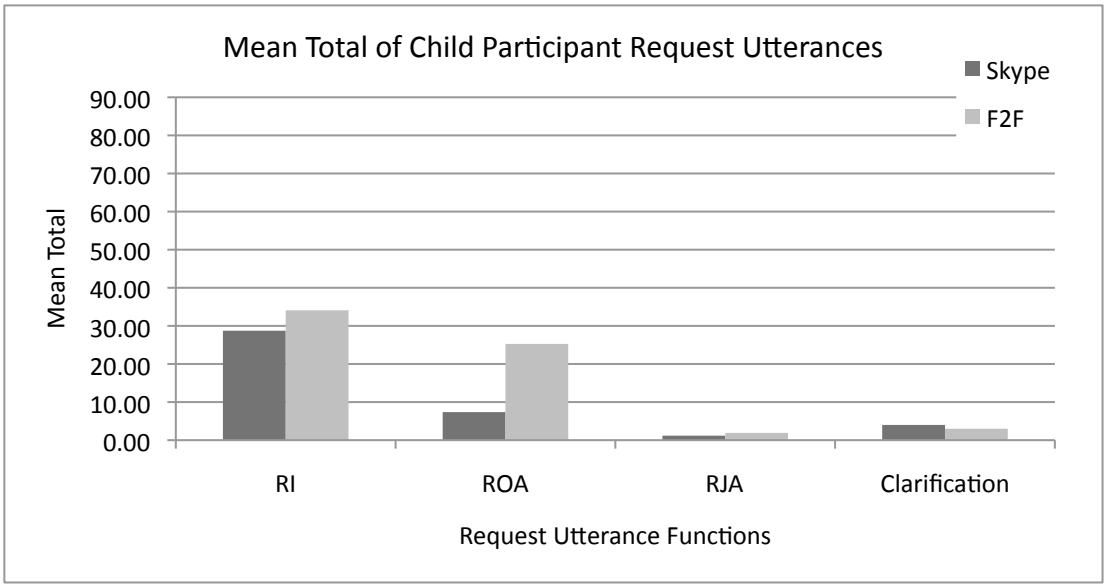

Figure 41: Mean Total of Child Participant Request Utterances

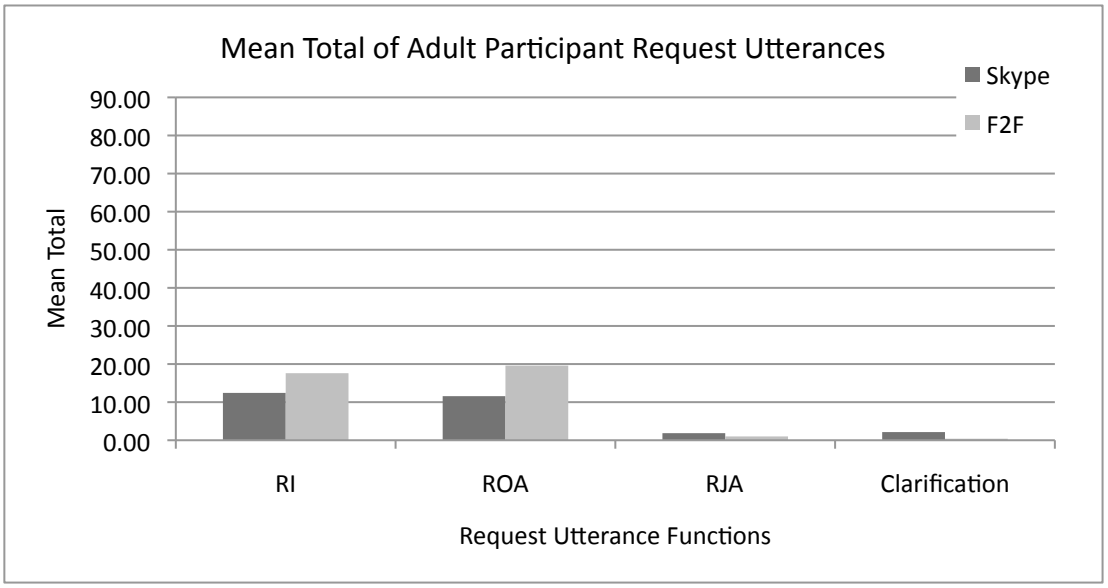

Figure 42: Mean Total of Adult Participant Request Utterances

The Chi square analysis set out in Table 53 showed that the observed differences in the use of RI and ROA utterances for the child and therapist differed significantly between session formats.

		Chi Square	Df	P = 0.05	Significant
1	Therapist use of requests for information and requests for objects/action	104.949	1	<0.001	Yes
2	Child use of requests for information and requests for objects/action	53.931	1	<0.001	Yes

Table 43: Chi square results for observed differences in speaker use of request utterances

The third group of utterances include confirming or denying (NCD), acknowledgements (NACK) and utterances that express emotion but do not necessarily use words (NSSE); the fourth category within this group was Nunintell and described any utterance that could not be transcribed and so was 'unintelligible' although responded to in the communication exchange between the speakers.

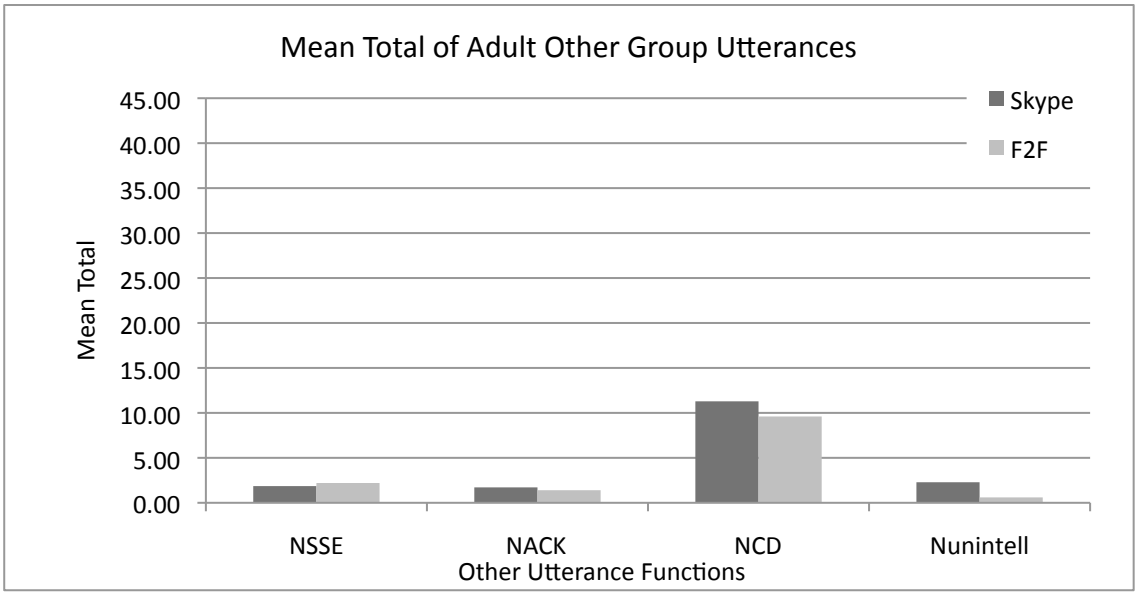

Figure 43: Mean Total of Adult Participant Other Group Utterances

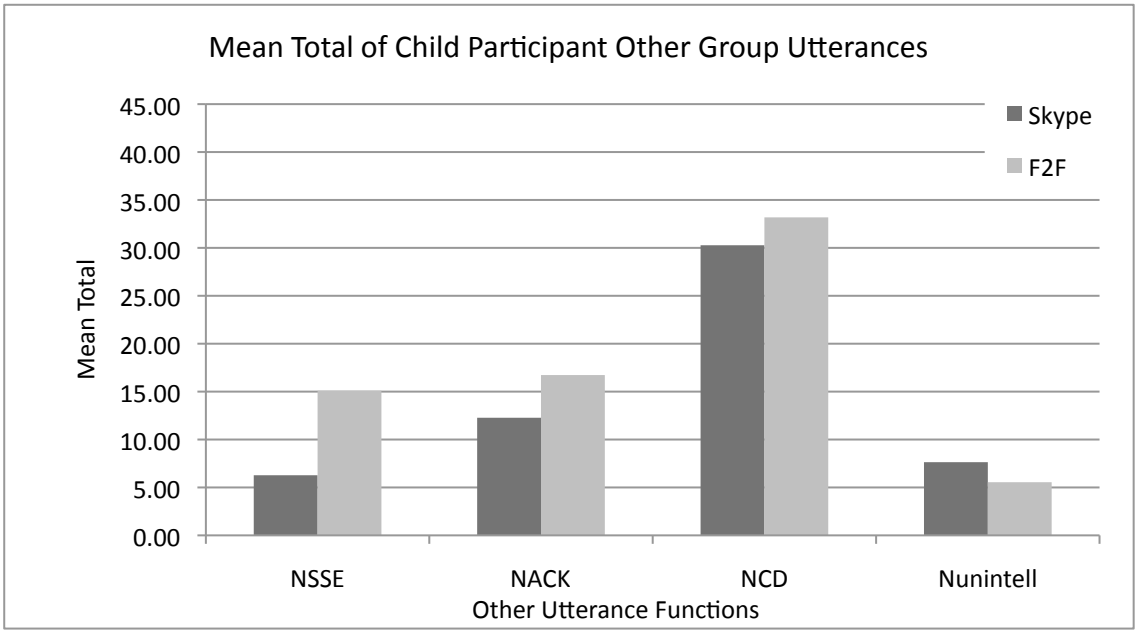

Figure 44: Mean Total of Child Participant Other Group Utterances

For the adult and child speakers, the majority of utterances were confirmation/denials (NCD) with fewer utterances expressing emotion (NSSE) and acknowledgements (NACK). The profile of these utterances for the adult and child speakers are set out in Figures 43 and 44. The child participants used more of these types of utterance function in the F2F session format than the Skype session. A chi square analysis, set out in Table 44, did not show a difference in the use of these utterances between the two session formats.

However, the therapist's profile of functions set out in Figure 45, showed more acknowledgements (NACK) used in the Skype session than in the F2F session and fewer confirmation/denials (NCD) in the Skype than the F2F session but the same number of expressing emotion utterances (NSSE).

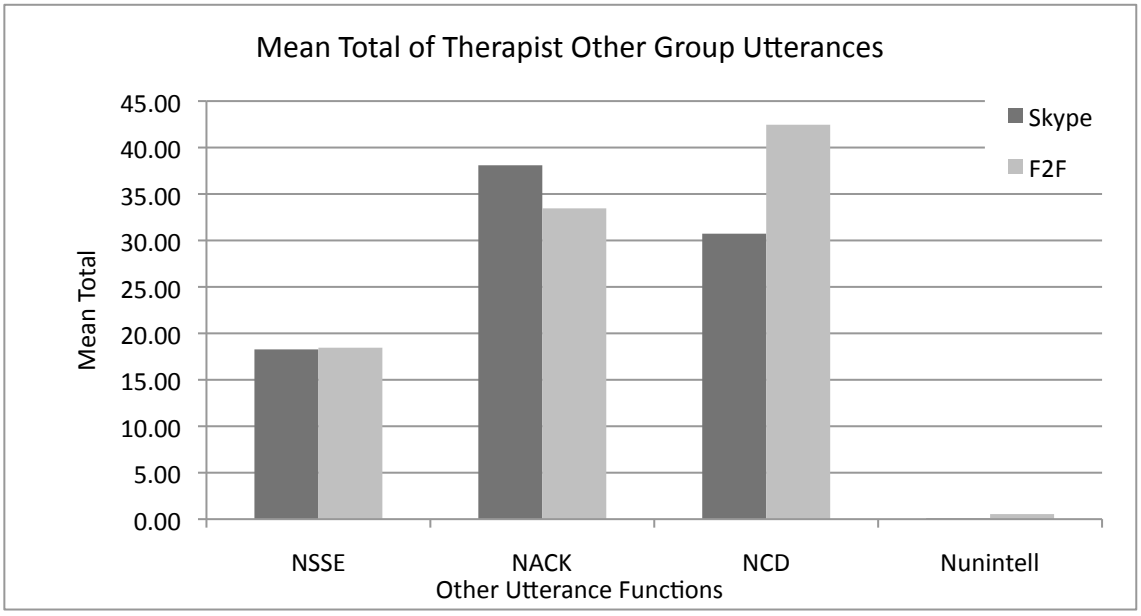

Figure 45: Mean Total of Therapist Other Group Utterances

The greater use of acknowledgements (NACK) by the therapist in the Skype session may reflect the need of the therapist to use verbal commentary to keep the child at the remote end on task when eye contact and physical presence cannot be used. Statistical analysis set out in Table 44 indicated a significant difference in the use of NACK and NSSE by the therapist between session formats.

	Experimental Hypothesis	Chi Square	Df	P = 0.05	Association
1	Child use of acknowledgement and confirmations	2.559	1	0.110	No
2	Therapist use of acknowledgement and confirmation	20.204	1	0.000	Yes
3	Therapist use of acknowledgment and emotional utterances	9.767	1	0.002	Yes

Table 44: Chi square results for observed differences in speaker use of other utterances

5.4.1.2 Interruptions and Overlaps

The total number of interruptions and overlaps were collated for all the transcripts and set out in Table 45. Combined together there were more interruptions and overlaps recorded in the Skype sessions; however, separated out there were actually fewer interruptions in the Skype (89) than in the F2F (105) sessions but more overlaps in the Skype (151) than the F2F (71) sessions (Figure 46).

Data	Skype Session	F2F Session
Total Number of interruptions	89	105
Range in a session	0 – 18	0 – 26
Median	7	9
Interruptions to therapist	68 range = 1 – 15, median = 6	90 range = 0 – 20, median of 4
Interruptions to Participant	16 range = 1 – 5, median = 4	15 range = 0 – 6, median = 1
Interruptions to Adult	5 range = 2 – 3	0
Interruptions from Therapist	13 range = 1 – 5, median = 1	15 range = 0 – 6, median = 1
Interruptions from Participant	63 range = 1 – 16, median = 5.5	88 range = 0 – 20, median =f 7
Interruptions from Adult	13 range 1 – 12	2 range = 1 – 1
Total Number of Overlaps	151	71
Range in a session	3 – 46	0 – 13
Median	7	8
Total of Interruptions and Overlaps	240	176

Table 45: Total number of interruptions and overlaps for all transcripts

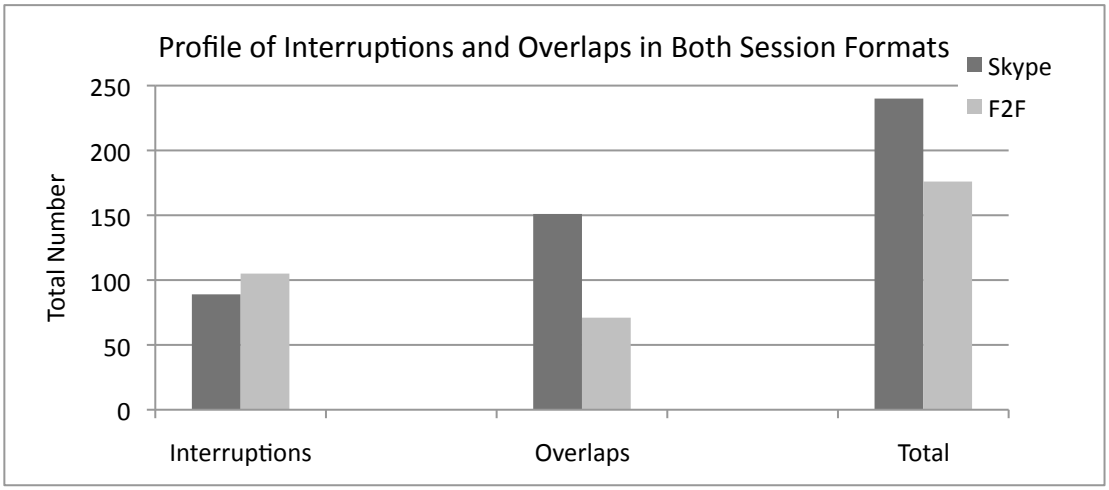

Figure 46: Profile of Interruptions and Overlaps in Both Session Formats

The interruptions recorded in the discourse analysis for each participant are set out in Figure 47. For two participants there were interruptions in one session format and not the other – for 8SM there were no interruptions in the Skype session and for 6JF none in the F2F session. For just one participant – 7JM - the number of interruptions was equal in both session formats.

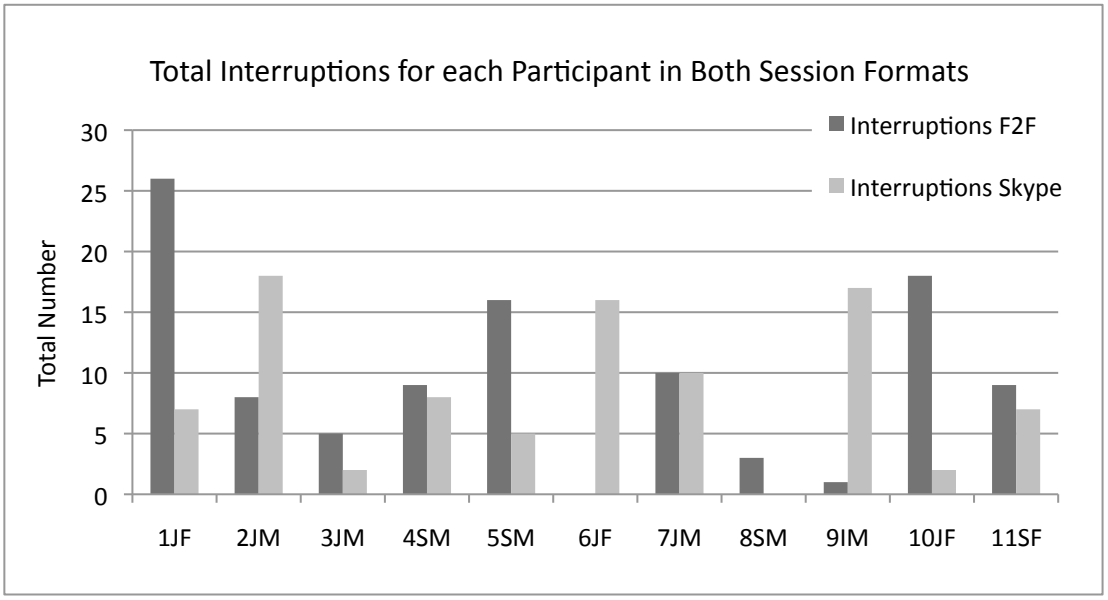

Figure 47: Total Interruptions for each Participant in Both Session Formats

The remaining eight participants all experienced interruptions to a greater or lesser degree in both session formats; for participants 1JF, 2JM, 5SM, 9IM and 10JF, there was a sharp contrast between the number of interruptions in the F2F and the Skype sessions and whilst participants 3JM, 4SM and 11SF also had more interruptions in the F2F sessions there was a more equal balance; double the number of interruptions were observed in the Skype than the F2F sessions for 2JM and 9IM.

Figure 48 shows the number of overlaps for each participant in the two session formats. Just as with interruptions, there were no overlaps in the F2F session format for participant 6JF. Participants 5SM, 8SM, 9IM and 10JF had an equal ratio of overlaps in both session formats. However, for the majority of participants – 1JF, 2JM, 3JM, 4SM, 8SM and 11SF - there were more overlaps in the Skype session format; for just two – 1JF and 2JM - the overlaps in the Skype session were double the number in the F2F session.

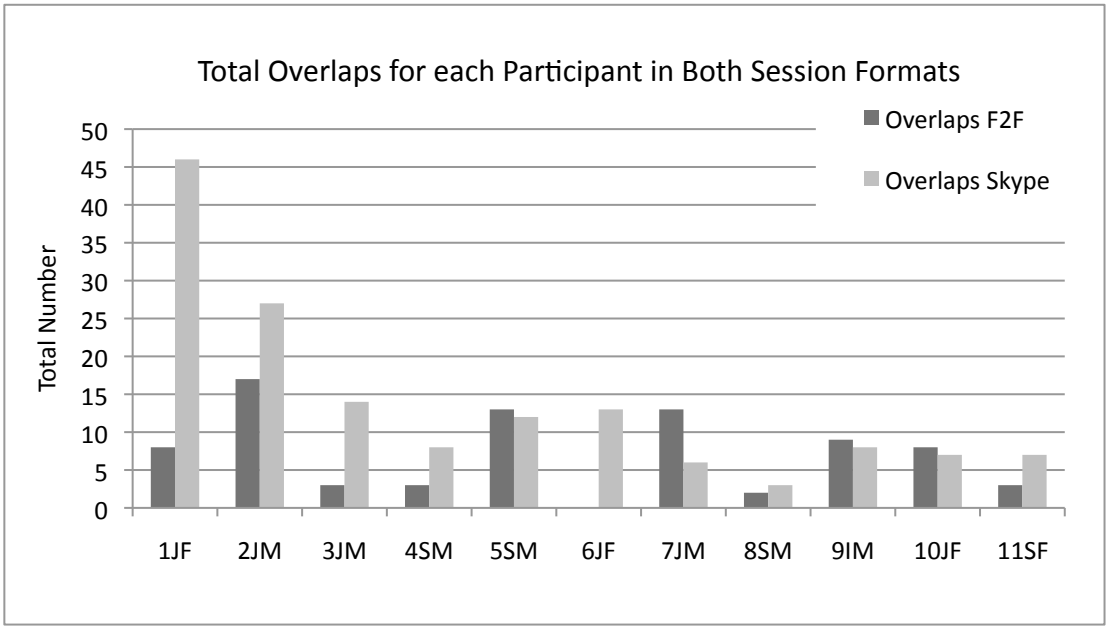

Figure 48: Total Overlaps for each Participant in Both Session Formats

Whilst the number of interruptions in both session formats was similar, the number of overlaps was greater in the Skype session format; the chi square analysis showed that the observed difference in the overlaps and interruptions between the two session formats was above chance.

		Chi Square	Df	P = 0.05	Significant
1	Overlaps and Interruptions	20.794	1	<0.001	Yes

Table 46: Chi square results for interruptions and overlaps in both session formats

5.4.2 Can the Child's Attention be held in the Skype Session?

The mothers of participants 9IM and 10JF, the youngest participants, had both commented in their post trial questionnaire that they felt their children kept their attention and focus better in the Skype than the F2F session. Both 9IM and 10JF had a diagnosis of sensory integration disorder; 9IM needed to hold small objects in his hands and also his mouth in the F2F session which he did not use in the Skype session; 10JF would periodically run away from the therapist in the F2F sessions but did not do so in any of the Skype sessions.

The session profiles for both these participants showed a greater number of goals were achieved in the Skype rather than the F2F session (Figure 14 on page 139) that

may account for the perceived improved attention in the Skype session. Examination of the discourse analysis for these two participants, identified differences and similarities between them that suggested that the therapist changed her interaction between the two session formats and in doing so, kept these two participants engaged with the therapy activities.

Their individual transcripts were reviewed and the raw data are set out in Appendix 39. 9IM's mother, unlike the majority of adults involved in any of the sessions, took an equal number of turns as the therapist. This is reflected in the number of utterances used and the Table 47 sets out the number of utterances for each speaker.

	Therapist	10JF	Adult
Skype Utterances	410	129	19
F2F Utterances	880	424	41
	Therapist	9IM	Adult
Skype Utterances	427	237	254
F2F Utterances	505	205	373

Table 47: Number of utterances for participants 9IM and 10JF in both session formats

9IM's mother reported on the questionnaire that 9IM was producing longer sentences in the Skype session; this was observed but the difference was small as his MLU was 2.3 in F2F sessions and 2.5 in the Skype session. However, unlike 10JF, 9IM produced fewer utterances in the F2F session than in the Skype session (Table 47). Whilst 9IM's MLU was the same in both session formats, he was producing more utterances in the Skype session which confirmed his mother's observation and perception that he spoke more and although he was not using longer sentences in the Skype session format.

Both 9IM and 10JF showed a different pattern of utterance functions between the session formats and from each other. 9IM used more requests for objects and actions (ROA) in the Skype session than in the F2F whilst 10JF used more of these utterances in the F2F session, reflecting the whole group pattern of utterance use. 9IM made no requests for clarification in the F2F or the Skype session whilst 10JF did in both session formats.

Both mothers had reported increased attention by their children in the Skype sessions; it might be expected that the therapist changed her use of those specific utterance

functions that could keep a child more focused despite not being in the same space – requests for joint attention (RJA), providing prompts (PP), providing feedback (PF) and providing clarification utterances which had not necessarily been requested. Figure 49 sets out the therapist use of these four utterance functions with these two participants.

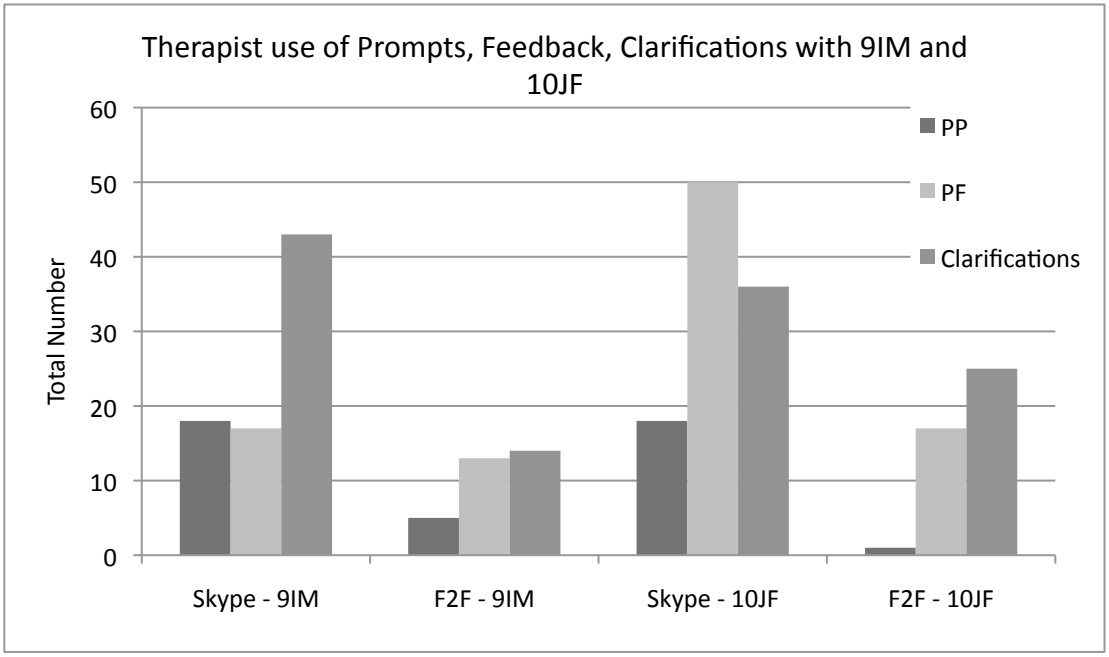

Figure 49: Therapist use of Prompts, Feedback and Clarifications with 9IM and 10JF

The therapist provided more clarifications, prompts (PP) and feedback (PF) utterances for both participants in the Skype session than the F2F session. Using the Chi square analysis a comparison of the use of these utterances with the pattern of use by the whole group of child participants was made. The results from that analysis are set out in Table 48. Figure 50 shows more PF utterances were used in the Skype than the F2F sessions for 9IM and 10JF. The increased use of feedback for 10JF was significantly different from the therapist use of feedback utterances with the whole group but this was not the case for 9IM.

		Chi Square	Df	P = 0.05	Significant
1	Therapist use of requests for joint attention (RJA) with 9IM and whole group in both session formats	9.177	1	0.002	Yes
2	Use of therapist requests for joint attention (RJA) with 10JF and whole group in both session formats	1.462	1	0.227	No
3	Therapist use of Prompts with 9IM and whole group in both session formats	8.894	1	0.003	Yes
4	Therapist use of Prompts with 10JF and whole group in both session formats	17.025	1	<0.001	Yes
5	Therapist use of Feedback with 9IM and the whole group in both session formats	0.163	1	0.687	No
6	Therapist use of Feedback with 10JF and the whole group in both session formats	11.722	1	0.001	Yes
7	Therapist use of Clarifications with 9IM and the whole group in both session formats	1.470	1	0.225	No
8	Therapist use of Clarifications with 10JF and whole group in both session formats	1.953	1	0.162	No

Table 48: Chi square analysis for therapist use of clarifications for RJA, PP and PF with 9IM and 10JF

Figure 50 shows that the therapist used more RJA utterances with 9IM and 10JF in the Skype session; the pattern of use was shown on Chi Square analysis to be significantly different for 9IM from the whole group of participants; this difference was not significant for the therapist's use of RJA utterances with 10JF.

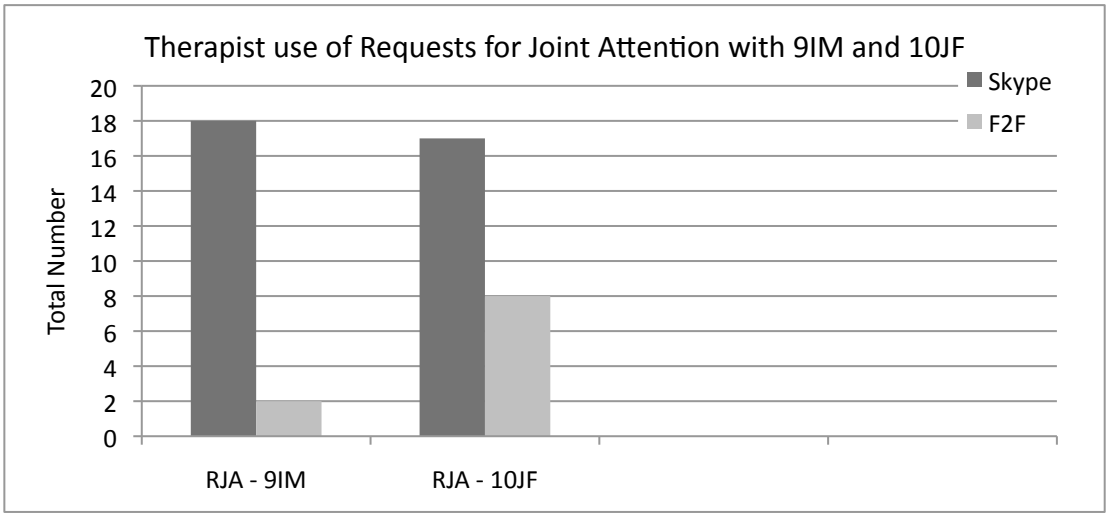

Figure 50: Therapist use of Requests for Joint Attention with 9IM and 10JF

These two participants completed more activities in the Skype session and so therefore more of their session goals were achieved in the Skype than in their F2F Speech and Language Therapy sessions. This suggests that the therapist handled these two participants in similar fashion that was in some instances significantly different from the rest of the group. Working through Skype, combined with change in the therapist use of particular utterance functions, enabled these two participants to achieve more therapy goals in spite of their age and difficulties with attention than when they attended a F2F therapy session.

5.4.3 Observed Differences in Interaction when handling the Objects in an Activity

Five of the participants – 1JF, 4SM, 6JF, 8SM and 10JF - in their interviews had commented that they preferred some activities in the F2F sessions because they could handle the playing pieces, although the handling was not a necessary part of the activity for the Speech and Language Therapy goal – the activity repeatedly mentioned was the game Cluedo. Two participants (8SM and 10JF) had used Cluedo in both the F2F and Skype session and these sections of the transcription were compared for turns, moves and functions to identify similarities and differences between the two session formats. The raw data from these transcripts can be seen in Appendix 29.

The child participants and therapist took an equal number of turns whilst the adult participants took the fewest turns; in the case of 10JF, the adult did not speak at any point during the Cluedo activity in the Skype session. There was a large difference in the number of utterances used in the Skype and the F2F session with fewer utterances spoken by all the speakers using Cluedo in the Skype session; this detail can be seen in Table 49.

	Skype	F2F
Therapist with 8SM	86	207
Therapist with 10JF	84	303
8SM	38	82
10JF	46	132
Adult with 8SM	10	26
Adult with 10JF	0	30

Table 49: Number of utterances for speakers using Cluedo in Skype and F2F sessions

The pattern of moves showed the expected peak of follow/initiation (F/I) moves for the therapist in both session formats for both participants. For both child participants there was an increase in the number of follow up (F) moves in the F2F session that can be seen in Figures 51 and 52.

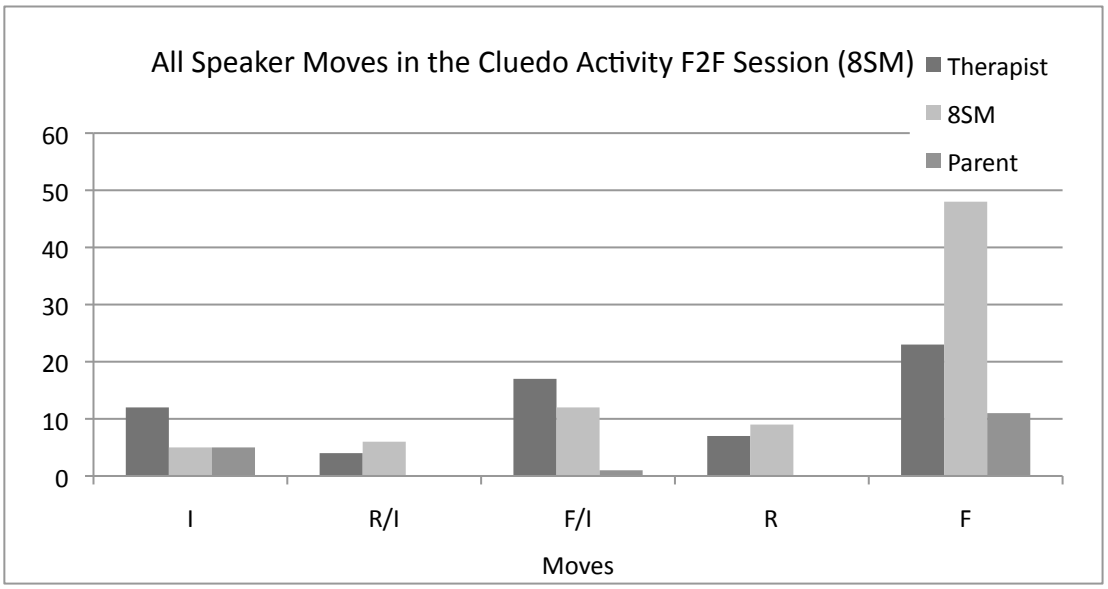

Figure 51: All Speaker Moves in the Cluedo Activity F2F (8SM)

There was no observable difference in the pattern of utterance functions so for all three speakers the majority of utterances had a providing function. The majority of these were providing information (PI); no prompts (PP) were used by any speaker but clarifications were provided by the therapist in both session formats with a small increase in the F2F session.

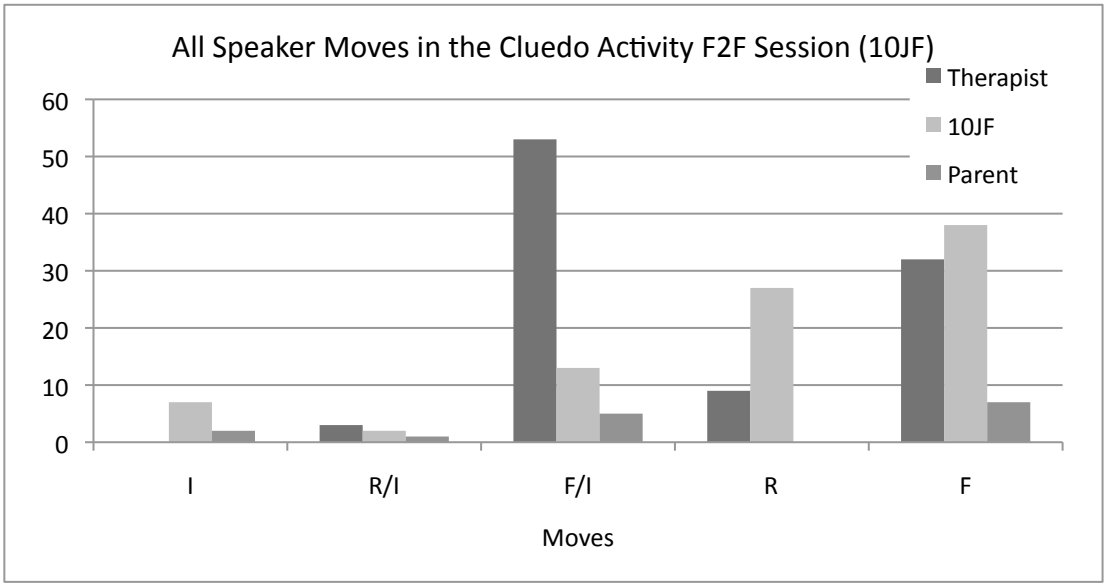

Figure 52: All Speaker Moves in the Cluedo Activity F2F (10JF)

The pattern of request utterances was broadly similar for all speakers with no marked difference from the mean total pattern for all participants; both participants used more information requests (RI) in the Skype session than the F2F and more requests for objects and action (ROA) in the F2F than the Skype. The therapist used requests for joint attention (RJA) only in the F2F session with 8SM but with 10JF used them in both session formats; in the previous section, the increased use of requests for joint attention (RJA) with 10JF and 9IM by the therapist has already been discussed.

In the Other group of utterance functions, there were more acknowledgements (NACK) and confirmations/denials (NCD) used by both participants in the F2F sessions.

There were no interruptions and overlaps for 8SM in either the F2F or Skype session format and only one overlap observed in the Skype session for 10JF. However, in the F2F session there were an equal number of interruptions and overlaps that totalled ten; the five interruptions all came from the participant who interrupted the therapist.

There were very few similarities to be found in the small section of transcripts compared for these two participants; the interaction differences observed might result from the different management approach required by the therapist that resulted in the use of requests for joint attention (RJA) with 10JF and not 8SM. The pattern of utterance functions was similar to the pattern observed for the total therapist and

child utterances in the two session formats. The main difference in using the Cluedo activity in the two session formats would appear to be the greater number of utterances used by both speakers in the F2F session format.

5.4.4 Do the Children Communicate more in the Skype Therapy sessions?

Participant 4SM observed in his interview that he worked harder in the Skype sessions and specifically in the Picdoku activity where he not only had to work out where the numbers would be placed to solve the problem but also give the therapist directions. Picdoku had been used with 4SM in the recorded F2F and Skype sessions; as with the transcripts of the Cluedo activity used with 8SM and 10JF, the transcript sections in the F2F and Skype sessions where the Picdoku activity was used were compared to identify any differences and similarities. The raw data results are set out in Appendix 30.

The first notable feature was the greater number of turns used in the Skype session to complete the activity along with a greater number of utterances for both speakers in the Skype session. The moves showed the same peak of follow up/initiation (F/I) moves for the therapist in both session formats.

The second feature noted from this transcript data was the increased use of request utterances by 4SM in the Skype session. Figure 53 shows the profile of utterance function groups for each speaker. This was unlike the pattern seen for the whole group of child participants.

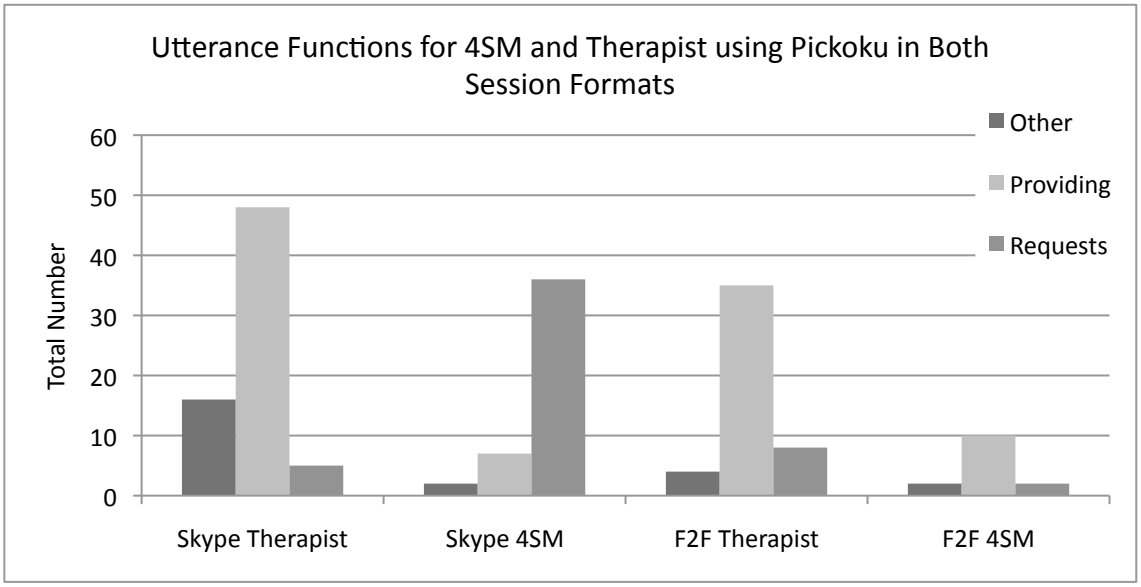

Figure 53: Utterance Functions for 4SM and Therapist using Picdoku in Both Session Formats

The specific request utterances for both 4SM and the therapist are set out in Figure 54 and show that 4SM used only requests for object or action (ROA) when the Picdoku activity was used in the Skype session whilst when used in the F2F session, he used no requests for objects or action.

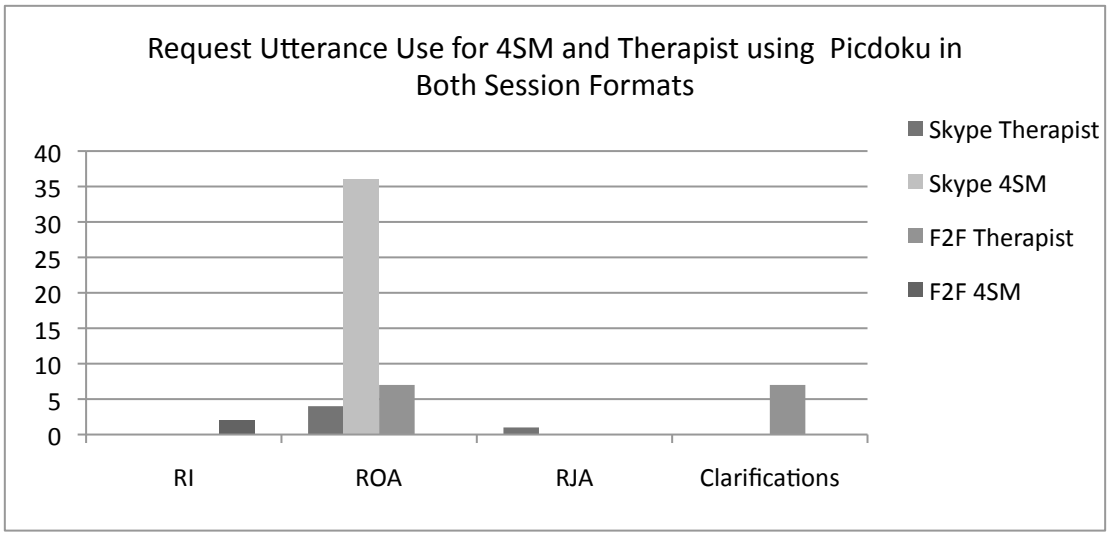

Figure 54: Request Utterance Use for 4SM and Therapist using Picdoku in Both Session Formats

5.4.5 Does the Skype Technology Interfere with the Interaction?

Previous research (Anderson et al, 1996, Bruce, 1996, O'Malley et al, 1996) had identified a number of interaction measures that had been linked to the impact of the technology on the interaction and the amount of activity achieved. First, an equal number of turns between speakers had been linked to minimal delay in the audio and video feed; second, fewer clarifications provided or requested had been linked to minimal audio and visual distortions; third, more turns had been needed to complete the same activity when F2F.

5.4.5.1 Turns

The mean total of turns as can be seen in Figure 55 and is shared equally between the therapist and participants in both session formats. In the F2F sessions, the mean for therapist turns is 255 with a range of 51 to 370 and a median of 260 whilst for the participants the mean is 240 with a range of 50 to 370 and a median also of 260. In the Skype sessions, the mean for the therapist is 210 turns with a range of 111 to 356 and a median of 193 whilst for the participant the mean total of turns is 205 with a range of 100 to 341 and a median of 203.

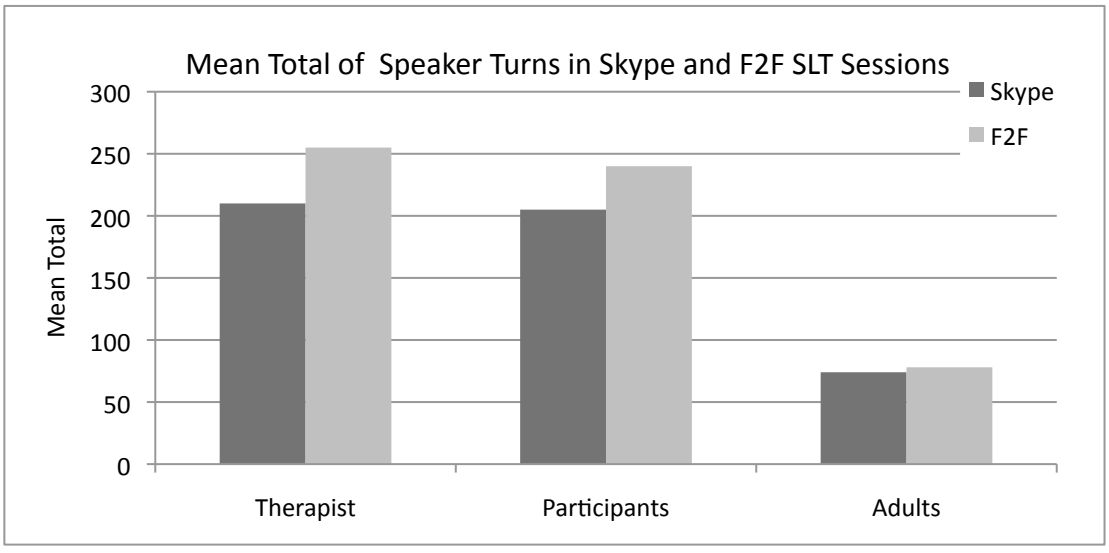

Figure 55: Mean Total of Speaker Turns in Skype and F2F Therapy sessions

The number of turns for each participant in the Skype and F2F Speech and Language Therapy sessions are set out in Table 50. For eight participants there is the same or

similar number of turns shared between the therapist and the participant i.e. within ten turns of each other – 3JM, 4SM, 5SM, 6JF, 7JM, 9IM, 10JF and 11SF.

	Skype Session			F2F Session		
	Therapist	Participant	Adult	Therapist	Participant	Adult
1JF	356	341	Not present	370	370	Not present
2JM	308	283	189	226	225	Not present
3JM	278	279	35	356	354	14
4SM	229	229	Not present	261	261	Not present
5SM	186	186	0	298	260	62
6JF	144	144	10	51	50	Not present
7JM	270	266	29	260	260	Not present
8SM	138	100	69	185	149	52
9IM	193	203	172	260	195	234
10JF	111	102	12	318	307	26
11SF	119	119	Not present	214	211	Not present

Table 50: Turn Numbers for All Speakers in Both Skype and F2F Therapy Sessions

The share of turns between the therapist and participant in the Skype sessions were similar whilst the adults' share of the turns is substantially lower than either the child or therapist. Unsurprisingly Chi square calculation did not support any difference in the turn taking of the therapist and child participant so that the share of turns was equal between the two speakers. The calculation did suggest that the difference in the turn taking between the supporting adult and child and the therapist was above a chance level (Table 51). As the adult participants were in support of the child, they took fewer turns than either the therapist or participant and so the Chi square calculation is unsurprising.

		Chi Square	Df	P = 0.05	Significant
1	Association between therapist and child participant turns	0.324	1	0.569	No
2	Association between the adult and child participant turns	41.717	1	<0.001	Yes
3	Association between the adult and therapist participant turns	37.440	1	<0.001	Yes

Table 51: Chi square results for the mean total of turns

For participants 1JF, 2JM and 8SM there was a difference greater than ten between the number of turns shared between the therapist and participant. Both participants, 2JM and 8SM, had a parent present with them in their Skype session and although

other participants had a parent supporting them in their Skype sessions, it may be that the parents of 2JM and 8SM simply took a greater share of turns so creating a difference in the share of turns between the therapist and child participant. In the F2F session, 2JM worked with the therapist on his own with a parent present in an adjacent room; the share of turns for 2JM and the therapist is within ten turns of each other in the F2F session. The adult supporting 8SM in his Skype session was also present in the F2F session and the share of turns between 8SM and the therapist in the F2F Speech and Language Therapy session format is the same as in the Skype format.

Unlike 2JM and 8SM, the adult support with 1JF was present only at the beginning and the end of either the F2F or the Skype session. However, in the F2F session unlike the Skype session, there was an equal share of turns between the therapist and 1JF. It had been observed that an equal share of turns indicated that the audio and video link disruptions were minimal (Anderson et al, 1996). Table 52 shows the total number of breaks counted over the trial period for each participant.

Participant	Total breaks	Session Length	Skype sessions Total	Average range
1JF	25	60 mins	5	5
2JM	32	60 mins	8	4
3JM	12	60 mins	5	2 – 3
4SM	14	60 mins	8	1 – 2
5SM	0	60 mins	5	0
6JF	0	30 mins	8	0
7JM	0	30 mins	6	0
8SM	0	30 mins	9	0
9IM	4	30 mins	7	0 – 1
10JF	1	30 mins	8	0 – 1
11SF	29	30 mins	9	3 – 4

Table 52: Total and session average Skype connection service breaks

1JF along with 2JM experienced a high number of breaks in the Skype connection; these breaks included distortions to the screen such as freezing or losing the sound as well as loss of the actual connection requiring the therapist to redial the participant. The technology rating for 1JF was one of the lowest because of the audio and visual quality; the most likely explanation for the difference in the share of turns between the F2F and Skype sessions is consequently a difficulty with the quality of the technology. That the majority of the participants had a more equal share of turns in

the Skype session and unlike 1JF did not indicate less acceptance with the quality of the audio and visual link, would suggest that the quality of the technology did not interfere with the interaction for most of the participants.

5.4.5.2 Use of Clarifications – Providing and Requests

Figure 56 sets out the mean number of clarification requests made by all speakers in the two session formats. It shows that the therapist made fewer requests for clarification in the Skype than the F2F session unlike the participants and supporting adults.

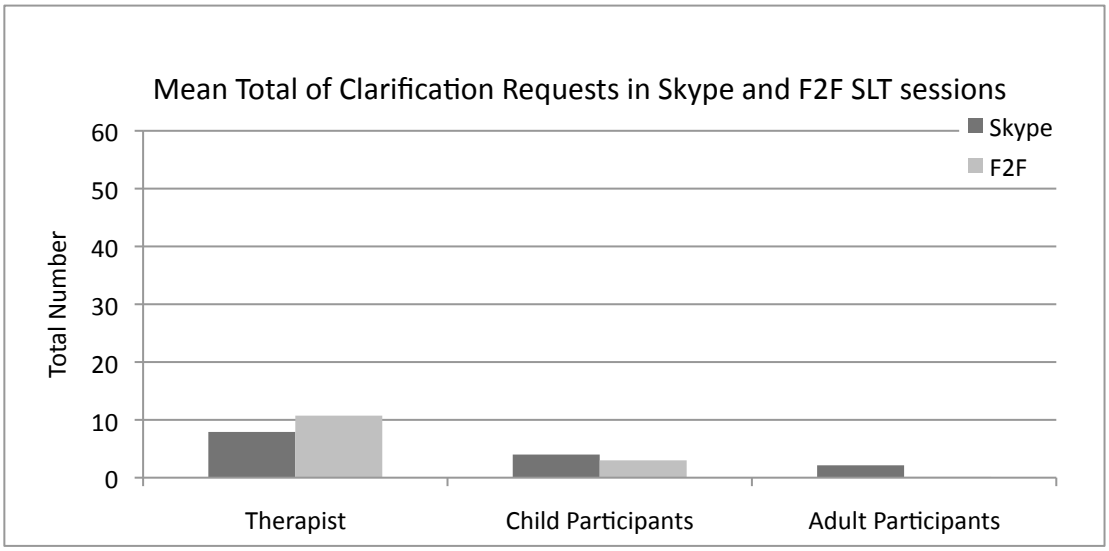

Figure 56: Mean Total of Clarification Requests in Skype and F2F Sessions for All Speakers

Figure 57 sets out the mean total of clarification utterances provided by all speaker groups in both session formats.

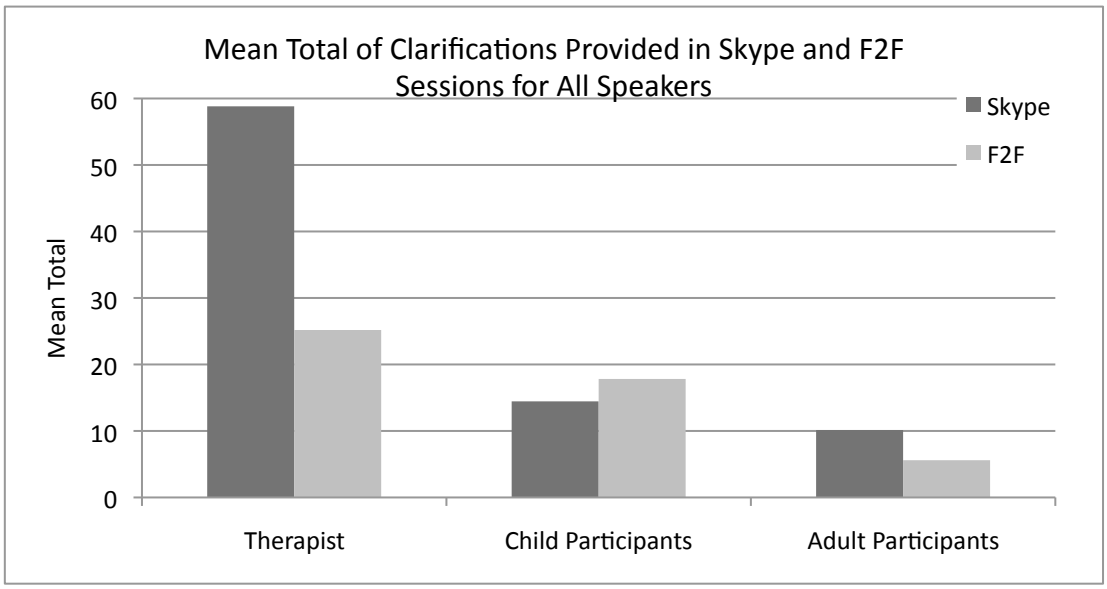

Figure 57: Mean Total of Clarifications Provided in Skype and F2F Therapy Sessions for All Speakers

The therapist provided more clarifying utterances in both session formats than the child or adult participants and used the greatest number of clarifying utterances in the Skype session.

The number of clarifications provided by the therapist does not correspond to the number of requests for clarification made by the child and adult participants. This would suggest that the therapist was providing unprompted clarification utterances. Comparison of the therapist use of clarification requests and providing clarification between the two formats was shown to be significant using Chi square analysis and is set out in Table 53.

		Chi Square	Df	P = 0.05	Significant
1	Requests for clarification by the child and therapist different in both session formats	4.865	1	0.027	Yes
2	Providing clarification by the child and therapist different in both session formats	55.484	1	<0.001	Yes
3	Requests for clarification and providing clarification different for the therapist in the both session formats	45.273	1	<0.001	Yes

Table 53: Chi square results for providing and requesting clarification

5.4.5.3 Clinical Activity

Previous research had used students to complete a construction task with another either F2F or using a videoconferencing system and had concluded that it was possible to complete the same task taking fewer turns (Anderson et al, 1996). The logical assertion is that being able to complete an activity with fewer turns could mean more activities completed in that session format; this would in turn mean that more of the session goals potentially would be achieved.

The two main speakers had an equal share of turns in the Skype and F2F sessions. However, all participants used fewer turns in the Skype sessions than the F2F sessions. (Figure 56 on page 191). More explicit comparison was carried out so that it could not be argued that using different activities in the two session formats would possibly reduce the number of turns in the Skype session. Twelve activities were identified in the transcripts that had been used in both session formats with the same participant and are set out in Table 54. Once identified, each activity was marked out in the transcript and the number of turns taken to achieve each activity for each speaker counted. The turn counts for each speaker during the activities in each session format are set out in Appendix 31.

For five of the twelve activities, the number of turns taken was greater in the Skype session than in the F2F session; these activities included Numberchase (2JM), Picdoku (4SM), Mastermind (5SM and 6JF), Alert Listening (6JF) and Quack Quack (9IM). All of these activities used in the F2F session, apart from the Alert Listening, do not require the child to give an instruction; however, in the Skype session using these activities, the child had to instruct the therapist to move playing pieces on the board so creating an additional language task for the child to complete the activity. Participant 4SM's observation that he worked harder in the Skype session has already been discussed in section 5.4.4 on page 182.

	Participant	Activity	Total Turns – Skype	Total turns – F2F	Change in Therapy use of activity in Skype
1	2JM	Numberchase	150	103	No
2	2JM	Goblet Kid	39	57	Yes
3	3JM	Cranium Conga	40	45	No
4	3JM	Goblet Kid	182	240	Yes
5	4SM	Picdoku	43	25	Yes
6	5SM	Mastermind	73	49	Yes
7	6JF	Mastermind	85	27	Yes
8	6JF	Alert Listening	75	11	No
9	7JM	Connect 4	43	113	Yes
10	8SM	Cluedo	64	139	No
11	9IM	Quack Quack	356	293	Yes
12	9IM	Guess Who?	86	267	No
13	10JF	Cluedo	52	199	No
14	11SF	Hop to It	61	100	No
15	11SF	Word Blind	79	175	No

Table 54: Total turn count for activities used in both session formats

Seven activities used more turns in the F2F than in the Skype session and included Goblet Kid (2JM and 3JM), Cranium Conga (3JM), Connect 4 (7JM), Cluedo (8SM and 10JF), Guess Who? (9IM), Hop to it (11SF) and Word Blind (11SF). Goblet Kid and Connect 4 required the child to provide an instruction to the therapist when used in the Skype session; the remaining five activities did not require change in terms of language use so no additional language activity was demanded from the child in the Skype session to complete the activity.

Three activities had been recorded with more than one participant and these were used to identify if the number of turns, in the Skype and F2F sessions, was the same for different speakers using the same activity. Figure 58 shows the total turns in the two session formats when using these three activities. For all three activities, the pattern of turns was the same for both participants; fewer turns were used in the Skype session with Cluedo and Goblet Kid. Although the Goblet Kid activity, like Mastermind, required the participants to give instructions and potentially increase the number of turns taken to complete the activity, fewer turns were used in the Skype than in the F2F session.

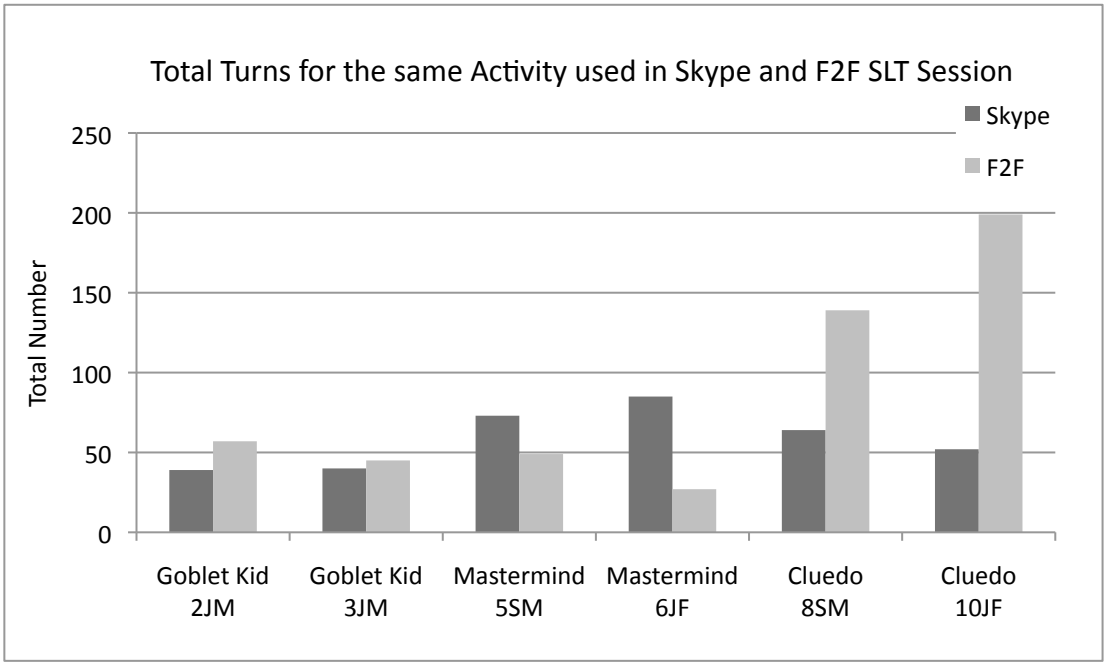

Figure 58: Total Turns for same Activity used in Skype and F2F Therapy Sessions

The Cluedo activity like the Goblet Kid needed fewer turns in the Skype session to complete the task. The mean number of activities used per session and the mean percentage of goals achieved are set out in Table 55 for each participant from the session profile data collected. The complete list of activities and goals for each session is set out in Appendix 32.

For seven of the participants – 1JF, 3JM, 4SM, 5SM, 6JF, 7JM, 9IM - more activities were achieved in the Skype than in the F2F sessions; two used the same number of activities in both session formats – 2JM and 11SF; and for the remaining two participants – 8SM and 10JF - more activities were used in the F2F sessions than the Skype sessions although the difference was one.

The number of activities used in the hour sessions was greater than in the half hour sessions and can been seen in Table 55. In the 60 minute Skype sessions the range of activities used was from three to seven with a mode and median of six and for the 60 minute F2F session a range of one to seven with a mode and median of five; in the 30 minute Skype sessions, the range was from two to five and for the F2F sessions was from two to four; for both 30 minute Skype and F2F sessions the mode and median was three.

Participant	Mean Percentage for Goals		Mean Percentage of Activities	
	Skype	F2F	Skype	F2F
*1JF	66%	62%	5.6	5.2
*2JM	78%	67%	6	6
*3JM	78%	53%	5.8	4.6
*4SM	83%	75%	4.6	3
*5SM	70%	60%	5.4	4.8
**6JF	73%	57%	3.3	3
**7JM	63%	58%	4	3.3
**8SM	56%	25%	2.8	3
**9IM	70%	43%	3.1	2.8
**10JF	79%	69%	3.1	3.5
**11SF	78%	80%	3	3
Key * = 60 minute therapy session ** = 30 minute therapy session				

Table 55: Mean percentage of goals achieved and activities used in Skype and F2F sessions

More activities completed in the Skype sessions than in the F2F sessions does not necessarily equate with the number of goals achieved as some activities could address more than one goal. All eleven participants achieved more goals in the Skype sessions whether lasting 60 or 30 minutes. The percentage range of goals achieved in the Skype session was 56% to 83% with a median of 73% and mode of 70% and 78%; the percentage range of goals achieved in the F2F sessions was wider - 25% to 80% - with a median of 60%. For six of the participants – 1JF, 4SM, 5SM, 7JM, 10JF and 11SF – fewer goals were achieved in the F2F session although the number of goals was not dissimilar to those achieved in the Skype session.

For the remaining five participants – 2JM, 3JM, 6JF, 8SM, 9IM - the disparity in goals achieved between the two session formats was greater; being able to handle the activities in the F2F sessions may well have reduced the number of goals achieved; specifically for 3JM there were more distractions in the F2F session – the family pet cat, refreshment breaks which were not a feature of the Skype sessions because a different room in their home was used; likewise, 9IM used none of his personal comforters – dummy and a range of 'twiddlers' – in the Skype session; in the F2F session, he could not manage without these and they not only reduced his ability to handle the activities but also distracted him from the tasks presented to him.

5.5 Cost Data Results

Figure 59 sets out the average cost per minute for each participant and for both session formats. The F2F session cost is consistently higher for all the participants; the cost range is £1.53 to £2.58 for the Skype sessions with a median of £1.77 and for the F2F is £2.28 to £4.44 with a median of £3.34.

The 60 minute Skype Therapy sessions cost less to provide per minute than the 30 minute sessions. Either of these Skype Therapy sessions, cost less to provide per minute than the equivalent F2F Therapy session formats. The range of costs for the longer Skype Therapy session was £1.53 to £1.73 with a median of £1.69 whilst the range for the 30 minute Skype Therapy session was £1.77 to £2.14 with a median of £2.04.

Just as with the Skype Therapy sessions, the longer F2F Therapy session cost less to provide than the 30 minute F2F Therapy session. The range of costs for the 60 minute F2F Therapy session was £2.28 to £3.64 with a median of £2.97 whilst for the 30 minute F2F Therapy session the range was £3.25 to £4.44 with a median of £3.89.

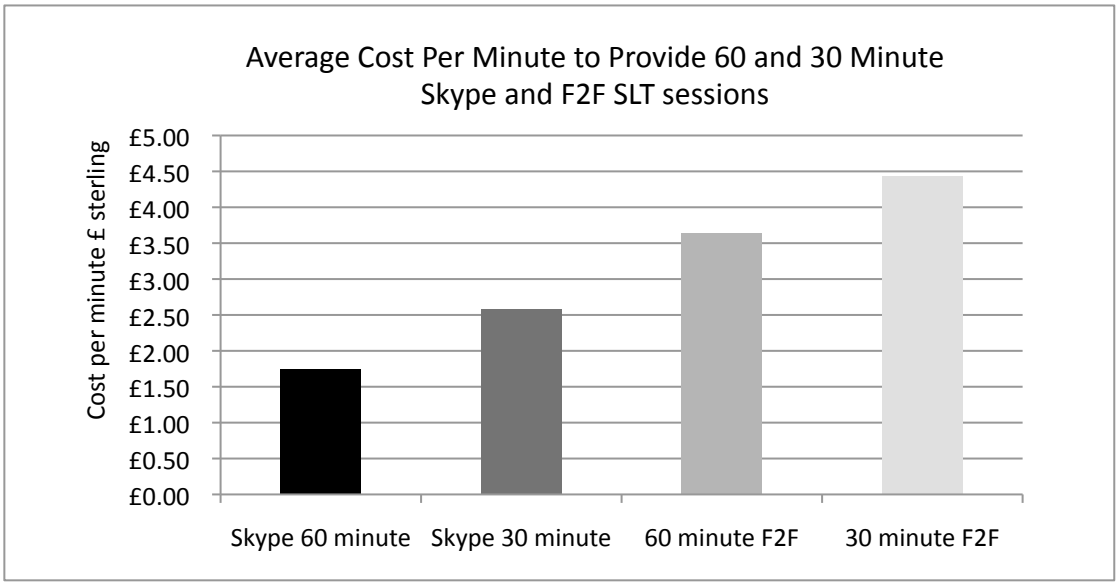

Figure 59: Average Cost Per Minute to Provide 60 and 30 Minute Skype and F2F Therapy Sessions

5.6 Summary

Whilst the data collected in this research is not sufficient in amount to draw definitive conclusions, interpretation of the separate data sources provides potentially useful information to guide the implementation of a Speech and Language Therapy service using Skype or an equivalent desktop video-conferencing system and this is discussed in Chapter 6.

Chapter 6 Summary

ASHA (2002) survey concluded that therapists had five reservations about using tele-technology and specifically video-conferencing to provide Speech and Language Therapy. Whilst ASHA was able to address the lack of professional guidelines developing its own professional guidance (2005), four perceived barriers to using video-conferencing remained. These barriers were first, reduced amount of clinical activity and therefore session goals that could be achieved; second, the reliability and potential interference of the technology; third, different interaction between therapist and client detracting from the Speech and Language Therapy process and fourth, costs to provide Speech and Language Therapy using video-conferencing technology.

6.1 Clinical Activity

The session profile rating of clinical activity i.e. number of goals completed for all participants, was higher in the Skype Speech and Language Therapy sessions than the F2F sessions (Figure 14 on page 140). All the children seemed to be broadly accepting of the clinical activity; they liked the activities presented to them in the Skype session and none of the children asked to have F2F sessions rather than Skype sessions; eight of the ten children interviewed had an acceptance rating of five or more on a scale with a maximum of six. For seven of the twelve adults who participated, their acceptance of the clinical activity increased with experience and for one their acceptance remained the same as most accepting.

Observations from the adults and children provided anecdotal support that the clinical activity in the Skype Speech and Language Therapy sessions, not only achieved the same clinical goals as in the F2F Speech and Language Therapy session but also provided unexpected clinical advantages; the children were reported by some to work harder and be better focused in the Skype sessions.

6.1.1 Amount of Clinical Activity

Previous research (Anderson et al, 1996) had shown that the same activity given to participants was completed with fewer turns when carried out using video-conferencing. If the data from this research showed fewer turns were used in the Skype session than the F2F session to complete the same activity, it would suggest that more activity could be fitted into a session making it possible to achieve more goals.

Fifteen activities had been used in both session formats with ten of the eleven participants (Figure 58 on page 191); a total of 1,428 turns were used to complete these activities in the Skype sessions (average of 95 turns per activity) whilst a total of 1,843 turns were needed to complete the same activities in the F2F sessions (average of 123 turns per activity). For nine of these activities, the number of turns taken in the Skype session was less than in the F2F session. For three activities, more than one participant had used the same activity and in each instance the same relationship of turns was seen in both session formats; for two activities – Goblet Kid and Cluedo – more turns were used in the F2F session and yet for the third activity – Mastermind – the reverse was true (Table 54 on page 190).

Whilst nine of the fifteen activities used more turns in the F2F session, six of the fifteen activities used in both session formats showed more turns were used in the Skype than F2F sessions. When reviewed, these six activities - Numberchase, Picdoku, Mastermind (used twice), Alert Listening and Quack Quack - required instruction from the child in the Skype session, when no instruction was necessary in the F2F session. Whilst these activities did not support the observation that fewer turns to complete an activity could lead to more clinical activity completed in the Skype session, it did lend additional support to 4SM's observation that he had to communicate more and so work harder in the Skype sessions.

Fewer turns were needed to complete an activity and combined with the observation that online health practitioner and patient interaction had reduced social conversation (Miller, 2010), logically the child and therapist would seem to be better focused in the

Skype session to work through more activities and consequently achieve as many and potentially more session goals than in a F2F session.

6.1.2 Working Harder

Participant 4SM, had low acceptance of the clinical activity in the Skype sessions; he observed that he worked harder in the Skype session. Direct comparison of an activity – Picdoku - used in both session formats with 4SM, showed that whilst the pattern of the therapist's use utterance functions in the F2F and Skype sessions was the same, there was a sharp increase in 4SM's use of request utterances; he used only two requests for objects or action (ROA) in the F2F session but 36 in the Skype session (Figure 54 on page 183). His increased use of ROA was greater than the mean total for all the child participant request utterances; request for information (RI) utterances – essentially questions rather than instructions - were the most frequently used request by all the child participants in the Skype session. 4SM had to organise his answer without being able to access the board directly; this possibly led to his perception of working harder.

6.1.3 Participant Attention

The parents of 9IM and 10JF observed that their children paid better attention and were more compliant in the Skype sessions. The session profile ratings for both these participants were high (Figure 14 on page 140).

There were just two similarities between these two participants that might suggest a similar feature in their interaction and the management of their behaviour in the Skype session. With both, the therapist used more prompting (PP) utterances in the Skype than the F2F session (Figure 49 on page 177); the increased observed use of clarifications was not significant (Table 48 on page 178); the increased use of requests for joint attention (RJA) was significant with 9IM but not 10JF and yet increased use of feedback (PF) was significant with 10JF but not 9IM. The changes in therapist interaction specific to each of these participants, 9IM and 10JF, were different to the

whole group and may be the reason that the parents felt that their child was better focused in the Skype session.

Both 9IM and 10JF had attention and non-compliance behaviours in the F2F sessions that were less obvious in the Skype format; in the Skype session the participants wore headphones and so noises around them were less distracting and combined with the therapist's increased use of prompts and providing clarifications, requests for joint attention and providing feedback, kept them better focused and able to achieve more clinical activity and therefore therapy goals.

6.2 Technology

The technology had naturally created anxiety for the therapists in ASHA's survey (2002) – being able to see and hear accurately and also manage should there be any interruptions or loss of connection. The number of activities completed and goals achieved is greater in the Skype than the F2F session, so the technology does not appear, despite interruptions and breaks in the connection and loss of audio and visual quality, to have reduced the amount of clinical activity achieved.

Figure 21 on page 149 sets out the pre and post trial views of the adults for the technology. Only two of the adults supporting the children – 3JM and 10JF – found the technology less acceptable with experience; for another two, 5SM-P and 8SM, their level of acceptance did not change; for the remaining eight adult participants their acceptance of the technology increased with experience; the shifts of acceptance were shown to be statistically significant. Those that found the technology less acceptable were not necessarily the least competent – in fact one was rated most competent (10JF).

Eight of the ten child participants interviewed found the technology acceptable with a rating of six or more on a scale with a maximum of nine; the two participants – 1JF and 8SM - who found the technology the least acceptable, each with a rating of four, were the two participants whose goals included aspects of articulation unlike the rest of the

participants whose focus was primarily language. Focussing on phonology and other speech sound activities may require better quality audio and visual acuity.

The majority view of child and adult participants suggested that the technology was acceptable. Determining the impact of audio and visual acuity with the number of interruptions and analysis of clarifications in the interaction, as well as computer competence, provided further support that the technology acceptable to them.

6.2.1 Audio and Visual Acuity

Experimental research had concluded that equal turns showed minimal audio delay or visual disruption (Anderson et al, 1996). In this research eight of the eleven participants - had either an equal number of turns or within ten turns of each other (Table 50 on page 185). This left three participants – 1JF, 2JM and 8SM - who had an unequal share of the turns with the therapist; the therapist in all three instances took the greater share; 2JM and 8SM had adults supporting them who took between 23% and 25% of the turns respectively; so more active involvement from the supporting adult may explain the difference in turns between therapist and participant. However, participant 1JF had no supporting adult in either session so the unequal balance of turns could not influenced by another speaker in the session.

The average number of breaks in service – interruptions - recorded is set out in Table 52 on page 186. Participant 1JF had a higher average number of breaks than the other participants and this may explain the unequal number of turns between her and the therapist. The high number of breaks would seem to indicate that the audio and visual link had been distorted; the session audio and visual ratings by the therapist for 1JF's Skype sessions were the lowest of all the participants.

The same experimental research (Anderson et al, 1996) had also concluded that more clarifications requested and provided indicated that the audio and visual link was periodically distorted. The combined requests for clarification of all speakers were greater in the Skype sessions than the F2F (Figure 56 on page 187) as were the provided clarification utterances (Figure 57 on page 188). This would suggest that the

audio and visual link was periodically distorted but despite that, the same level of clinical activity was achieved in the Skype as the F2F sessions.

6.2.2 Breaks in the Skype Link

For four participants there were no interruptions as a result of the technology failing in their Skype sessions. For the remaining seven participants the average number of breaks in a session was 0.13 to 5; the average number of interruptions for the 60 minute sessions was greater than for the 30 minute sessions (Table 52 on page 186). The participants who showed an unequal share of turns (1JF, 2JM and 8SM) did not necessarily have the greatest number of breaks in the Skype connection – 8SM had no breaks in the course of all his Skype sessions whilst 1JF had the most. Those also most affected with breaks in the Skype session were not necessarily those that lived in remote villages – 2JM, 3JM and 10JF. However for the adults with 3JM and 10JF, the breaks may have been the underlying reason for the negative change in their view of the technology.

6.2.3 Computer Competence

Managing the remote end of the tele-technology link had been a specific drawback for the therapists in ASHA's survey (2002) based on their own lack of experience and training and the anticipated client's unfamiliarity with the technology.

Three of the twelve adults who completed the questionnaire were considered least competent – 2JM, 5SM-P and 8SM. Participants 2JM and 8SM found the technology and interaction more acceptable with experience; 2JM found all aspects of the Skype sessions more acceptable with experience whilst 8SM did not although the rating was still high – seven on a scale with a maximum of eight; participant 5SM-P found the technology, interaction and clinical sessions less acceptable with experience (Table 32 on page 147). Unlike the other adults, 5SM-P, was a Learning Support Assistant who in addition to managing the technology, also had the responsibility for organising a room within a busy secondary school, ensuring that the necessary equipment was available and managing the pupil without any managerial or therapist support.

Figure 21 on page 149 sets out the acceptance of the technology by the adults. Two of the three adults considered least computer competent, increased (2JM) or maintained (8SM) their level of acceptance with experience whilst for one acceptance reduced (5SM-P). The adult who achieved the most competent rating (10JF) also shifted her views of the Skype sessions; she found the technology, interaction and clinical activity within the sessions less acceptable with experience. The negative shift of view for the least (5SM-P) and most (10JF) computer competent adult did not preclude the continued use of Skype to provide the Speech and Language Therapy sessions for 5SM and 10JF once the trial was over. However, computer competency did not appear to be an indicator of acceptance.

6.3 Interaction

For therapists there was concern that the interaction between client and therapist would be changed using video-conferencing (Skype); the interaction is pivotal to making therapy successful what ever form it might take – assessment, consultation, exercise activity. However, if interaction in the two session formats – F2F and Skype - was similar for share of turns, moves, utterance functions and interruptions/overlaps, it would indicate that interaction in the Skype session format mirrored interaction in the F2F session.

The adult participants showed a wide range of acceptance ratings for the interaction (Figure 22 on page 150). Three showed no change in their acceptance (5SM-P, 6JF and 8SM) but two of these had the greatest acceptance rating of interaction (6JF and 8SM). Two of the adults showed less acceptance of the interaction (3JM and 10JF) but seven of the twelve adults (1JF, 2JM, 4SM, 5SM, 7JM, 9IM and 11SF) showed increased acceptance of the interaction with experience and this change in view was statistically significant.

Eight, of the ten child participants were positive about the interaction and did not report any difficulties or problems that detracted from the interaction (Figure 27 on page 158). However, two participants – 5SM and 2JM - found the interaction less

acceptable; both these participants were newly referred to Speech and Language Therapy; neither provided any specific observations about the interaction that might have explained why they found it less acceptable than in the F2F sessions. Another participant, 11SF, did reflect that seeing the expressions better and being able to talk for longer was an advantage of the F2F Speech and Language Therapy session; 4SM, who showed the greatest acceptance of the interaction in the Skype Speech and Language Therapy sessions, did reflect in the interview that F2F Speech and Language Therapy sessions would be better if the child did not know the therapist; 4SM had worked with the research therapist since he was six years old whilst 11SF was referred to Speech and Language Therapy for the first time during the research trial period.

Acceptance of the interaction in the Skype Speech and Language Therapy session may be influenced not just by the actual features of the interaction itself but also by the level of experience of Speech and Language Therapy and familiarity with the therapist.

6.3.1 Direct Comparison of the F2F and Skype Interaction

Direct comparison of the F2F and Skype session interaction showed that the ratio of turns and moves for each speaker group was the same in both session formats (Figures 30, 31 and 32 on pages 161 and 162). Some differences were observed with an increased use of Response (R) and Follow Up (F) moves by the child participants in the Skype session. The ratio of the three main utterance functions – Providing, Requesting and Other - was the same for all speakers in both session formats (Figures 34, 35 and 36 on pages 164 and 165) and equally the MLU for the therapist and the participants was the same in both session formats (Figure 33 on page 163). The range of provision utterances followed the same pattern for all three speakers. The child and therapist used more requests for information (RI) than requests for objects and action (ROA) in the Skype session (Figure 40 and 41 on pages 168 and 169) but broadly an equal ratio of RI and ROA utterances in the F2F session. Whilst there were no significant differences for the adult and child participants in their use of the other group utterances in both session formats, there were significant differences in the therapist's increased use of acknowledgements in the Skype session and fewer confirmations in the F2F session format (Table 46 on page 175).

6.4 Costs to Provide

This research considered only the costs to provide the F2F and Skype Speech and Language Therapy sessions from the provider perspective and not the families'. Comments on two of the adult questionnaires – 2JM and 10JF - revealed that there were identifiable costs to the families – printing and preparing the materials sent in advance of a session; none of the other adult participants identified any other costs and both 2JM and 10JF continued with Skype sessions after the trial was completed despite this observation.

For all the participants whether located in an urban or rural location, the average cost per minute to provide the Skype Speech and Language Therapy sessions was less than for the F2F sessions – the average cost per minute to provide the Skype session was calculated at £1.77 and for the F2F session was £3.34. Such a sharp observed difference in the cost makes the Skype Speech and Language Therapy attractive to the provider. The reduced cost of the Skype Speech and Language Therapy sessions can also be attractive to patients who can have their sessions scheduled in the most convenient location to them – home or school - without the costs of travel to a health clinic. Whilst one adult participant observed that the Skype service passed on the costs of printing and preparing materials to the participants, there is also potential to pass on savings to the user with reduced fees.

6.5 Conclusion

The number of goals achieved was greater in the Skype than the F2F sessions; those children with attention difficulties were perceived to be better able to focus in the Skype session with more requests for joint attention (RJA) and clarifications provided to keep them focused; one participant used more requests for object and actions (ROA) in the Skype session so taking on a more active role in the session and seeming to 'work harder'.

Adult acceptance of the technology was high but increased with experience; this shift was significant; the share of turns was equal for most participants and suggested that the audio and visual distortions were minimal; fewer breaks to the Skype session may support greater acceptance although breaks and interruptions from poor and audio visual activity, did not seem to lessen the amount of clinical activity that could be achieved; the computer competence of users did not appear to be related to acceptance of the Skype sessions.

There were a number of positive aspects to the Skype Speech and Language Therapy interaction – most interaction features for the therapist and child remained the same in both session formats. The adults did not express any concerns about the interaction in the Skype Speech and Language Therapy sessions and nor did the children when interviewed. The differences in the use of request of object/action (ROA) utterances seen in specific activities such as the Picdoku, could be used to advocate Skype sessions because the Skype session provided an opportunity for the child to use ROA utterances – useful to develop not just the expressive language skill that requires grammatically correct requests but also a situation that enables pragmatic language skill to be practised. A session format that naturally increased the use of specific utterance functions becomes a therapeutic tool and not just a service delivery solution.

The majority of participants reported that they found the interaction in the Skype session acceptable. Out of this group of adults and participants, a majority of 17 out of 22, had experience of Speech and Language Therapy even if it was not this specific Speech and Language Therapy Service; of the five adult and child participants who found the interaction less acceptable, three had no experience of Speech and Language Therapy nor the specific therapist; the level of familiarity with either Speech and Language Therapy or the therapist may influence the acceptability of interaction in the Skype session.

The difference in the cost to provide the Skype Speech and Language Therapy sessions cannot be ignored especially when combined with other factors that suggest that the clinical activity, technology and interaction can be equal to the F2F session format. In

the final chapter, the future use of tele-technology to provide Speech and Language Therapy services will be discussed based on the findings and experience of this research.

Chapter 7 Discussion

This final chapter first reflects on the research findings and second, reviews the research process before finally considering the future use of video-conferencing, such as Skype, to provide Speech and Language Therapy.

7.1 The outcome of this research - using Skype to provide Speech and Language Therapy Service can be acceptable

Other research has already shown that the three aspects of any Speech and Language Therapy service – liaison, assessment and therapy (ASHA, 2001) - can be provided using a video-conferencing system. As the technology has progressed Speech and Language Therapy services have been able to use systems, such as Skype, that work through an ordinary desktop computer (Brennan et al, 2004; Pierrakeas et al, 2005; Waite et al, 2006; Howell et al, 2007; Grogan-Johnson et al, 2010; Constantinescu et al, 2010; Hein Ciccia et al, 2011; Malandraki et al, 2011); the client groups served have expanded from those with acquired impairment to those with developmental language impairments, fluency, voice and articulation difficulties; the age range has increased from adults to children aged as young as three years (Table 2 on page 36). Whilst the feasibility of providing liaison, assessment and specific Speech and Language Therapy intervention programmes has been demonstrated over the last twenty years along with client acceptance, no research has aimed to evaluate how acceptable a Speech and Language Therapy service provided remotely might be from the therapists' point of view.

Four areas of therapist concern when using tele-technology and specifically video-conferencing to provide Speech and Language Therapy were identified from ASHA's survey (2002) - clinical activity, technology management, interaction and costs. The four concerns were each evaluated and to be acceptable each had to provide the same service as the F2F sessions. Data were collected in each session relating to activity completed in the session, time to prepare and provide the actual session as well as write up the session case notes along with travel costs, video recordings of the

interaction in both session formats and the views of the adult and child participants to compare the Skype with the F2F sessions. This comparison aimed to establish whether the Skype sessions could provide the same amount of clinical activity, enable the same pattern of interaction without the technology detracting and be provided at the same cost or less as the F2F sessions. The results whilst not definitive, suggest that there is potential to provide Speech and Language Therapy using tele-technology, such as Skype, that is acceptable to therapists because the therapist concerns about using video-conferencing (ASHA, 2002) were not shown.

First, ASHA survey (2002) had identified that therapists were concerned that using video-conferencing would mean less clinical activity would be completed in a session. However, for all the participants more session goals were completed in the Skype than the F2F session (Table 55 on page 192). One child (4SM) reported that he worked harder whilst two adults (9IM and 10JF) felt that their children were better focused in the Skype session; changes in the interaction for these three participants identified differences in the interaction style of the therapist and participant between the Skype session and F2F session. Fewer turns were needed to complete the same activity in the Skype session and those activities that used more turns showed an increase in the use of specific utterance functions such as request for objects/actions (ROA). Changes in the interaction suggest that the Skype sessions can facilitate better focus on activities and can be the tool to elicit specific language activity such as giving direction or instructions.

Second, the same survey (ASHA, 2002) had identified that the therapists were concerned that the technology would be hard for users to manage and also the interaction would be disrupted because of the quality of the video and audio. However, there was a positive increase in the adult rating of the technology that was significant (Table 33 on page 148); there were an equal number of turns in the Skype sessions between the therapist and child; other research (Anderson et al, 1996) suggests that this means that there was minimal audio or visual distortion so making the technology acceptable to the users because it did not interfere with the interaction.

Third, the therapists in the ASHA survey (2002) were concerned that the interaction between the therapist and patient using video-conferencing would be altered and so interfere with the therapeutic process. In this research there was an increase in the adult acceptance of the interaction that was significant (Table 33 on page 148). There were significant differences for some specific aspects of the interaction in the two session formats – the children's increased follow up (F) moves in the F2F sessions and increased use of response only (R) moves in the Skype sessions (Table 41 on page 166). The child participants were observed to use double the number of requests for object/action (ROA) in the F2F sessions (Figure 41 on page 169). The therapist increased her use of confirmation and denials (NCD) in the F2F session and increased acknowledgement (NACK) utterances in the Skype session (Figure 45 on page 172). However, despite these observed differences in the interaction in the two session formats, the number of turns, initiations (I), response with initiation (R/I) and follow up with initiation (F/I) moves and utterances with a providing function were similar in both session formats for all speakers. Fourth, the ASHA survey (2002) of the therapists had identified concern around the cost to provide the Speech and Language Therapy using video-conferencing and yet the Skype Speech and Language Therapy sessions cost substantially less to provide than the equivalent F2F sessions.

Technology has improved in the last four years since 2008 and since the start of this research project, there has been an increase in the use and acceptance of technology in everyday activities by a greater number and wider range of the population. The cost of the computer and peripherals has become more affordable with good audio and video quality so that providing a health service remotely does not become exclusive to those that have a computer or reliant on a remote connection in a health service building. This affordability and the 'Race Online 2012' Government initiative to provide every household in the UK with a computer and broadband internet access (Lane Fox, 2011) will improve the technology reliability and reduce the number of service breaks. The interface with computers and the software packages needed to provide a Skype or equivalent system have become more intuitive and consequently easier to use whatever the age or experience of the user. Virtual networking, both professional and social, using Facebook, Linkedin and Twitter provide a constant stream of communication between people who are not in the same space;

communicating this way has become commonplace, both the number of people using these systems and also the frequency of use (Bannon, 2012, Sedghi, 2012).

The increased use of tele-technology and the opportunities to use it socially help to reduce therapists' reservations around managing and using the tele-technology as well as the anxieties around how it will affect interaction. The changes that have been observed in the interaction in this research suggest that the Skype sessions create opportunities to elicit different utterances from the children so that working through a video-conferencing link becomes a therapeutic tool and not just a service delivery solution. This is shown with close examination of the Picdoku activity with participant 4SM who showed that he used more requests for action (ROA) in the Skype session than in the F2F session (Figure 54 and 55 on pages 183 and 184). There may be additional benefits to Speech and Language Therapy services using Skype not specifically accounted for in this or previous research evaluating the use of video-conferencing to provide Speech and Language Therapy; this could include more time to prepare for sessions (Miller, 2011), less wastage from missed appointments, flexible availability to fit in with school schedules or work routines for patients and increased job satisfaction for the therapists.

7.2 Reviewing this research

Collecting the various data strands for the eleven participants was successfully completed and managed. However, as with any research, limitations were identified that in turn influenced the interpretation of the results.

7.2.1 Participants

It was a priority to recruit participants that were willing and for whom a benefit could be identified and drawing upon only a single independent Speech and Language Therapy practice limited the number of possible participants to eleven. As the independent Speech and Language Therapy practice did not cater for a specific client group, the participants consequently had a wide range of communication impairments

and widely differing goals; in turn this meant that a wide range of different activities and materials were used.

Whilst there was no unifying feature for the participants – age group, medical aetiology, communication impairment, therapy goals or materials used – the results were positive and suggest that providing therapy through Skype can be acceptable. Recruitment of participants with a common characteristic would help to identify the key features in clients with that presenting communication impairment that made providing therapy through Skype most likely to be acceptable. A larger number of participants, drawn from other caseloads would not only provide more data but also lend more weight to the results by reducing the bias in the caseload of a single independent therapist. An increase in the number of participants recruited from more than one therapist caseload would improve the validity of the results.

7.2.2 Therapist

The Speech and Language Therapy service involved in this research was a single therapist practice and whilst this might be seen as a controlled feature, it limited the comparison of the session activity, management of the technology, interaction and time management/costs to just one therapist. By involving more therapists more data would potentially be collected and similarities or differences identified would confirm or not the results from the data collected in this research.

Separating the two roles – researcher and treating therapist – to have an independent evaluation would also have potentially increased the feedback from the adult and child participants by lessening their inhibitions as well as increasing objectivity in any observations and removing potential bias in the data collection process.

7.2.3 Data Collection

The recording of the F2F session was not seen as an issue initially – the primary problem was being able to record a Skype session successfully. This was successfully resolved; the interaction data for the Skype session then included every aspect of a

typical session from the start to finish and was completely unobtrusive whilst no equivalent recording would cover the complete F2F session and also be unobtrusive. That the whole Skype session was recorded from initial greeting to ending the session might explain some of the differences observed in the interaction data – had the two session formats been recorded in identical fashion there might have been fewer differences in the interaction patterns observed. Setting up a video recording in a clinic would, like the Skype recorded sessions, have brought greater uniformity to the F2F session recordings. However, then the child would not have been in their home as they were for the Skype sessions. This was also not a workable solution to the F2F session recording for this therapy service with no clinic base, but might be for those that are not peripatetic and run from health clinic bases. Examining the interaction differences and similarities between the two session formats could be examined outside of the clinical situation; this would mean that specific activities could be selected and recorded in the two formats for direct comparison and whilst potentially artificial would provide a more accurate and direct comparison of the two session formats.

The pre and post questionnaires were successful – none of those asked to complete the questionnaire reported any difficulty following the instructions, all the questionnaires were completed and the adult participants offered additional comments in their feedback freely. However, the participants did not all have the same proportion of Skype and F2F sessions – four of the participants (4SM, 8SM, 10JF and 11SF) had more Skype than F2F sessions and in some instances the adults did not always attend the F2F sessions (1JF and 2JM); in both these instances the adult participants had reduced experience of Speech and Language Therapy whether F2F or through Skype. Controlling the adult participant experience of the Skype or F2F sessions may have prompted greater comment and more equable experience of both session formats that could in turn have influenced their responses to the questions. However, controlling the amount of experience that the adults had of the therapy sessions would inevitably complicate the delivery of the therapy service and would for this research have reduced the number of participants.

The interviews with the children all followed the research protocol and allowed the children to determine how their views were recorded to ensure that they were comfortable and relaxed; more views might have been gained with an interviewer independent from the treating therapist and the potential for bias in influencing the opinions of the children with the treating therapist and researcher being the same person would be lessened. Whilst it was not logistically possible in this research, interviewing participants similar in age or communication impairment together might have prompted more spontaneous as well as a wider range of views. Asking the children to rate their responses using emoticons would have been both easier and considering the language difficulties for these participants been, potentially, more reliable and consistent between the children. This in turn would have made the interview data both easier to collect and a more reliable response.

Providing a scale to standardise the ratings for the data collected would improve the reliability of that data collected e.g. the audio and visual acuity and also involve the participants in providing ratings for the same aspect – this would mean that the visual and audio acuity was not rated solely from the therapist's perspective. Rating scales that covered the subjective aspects of the therapy situations such as the child's level of participation or anxiety would have addressed more directly the therapist concerns that interaction in a Skype session was less acceptable. This could have been achieved using a rating scale with emoticons so that the complications of consistency and reliability would have been reduced and data from the remote end of the Skype link captured.

7.2.4 Data Analysis

This research used a number of different types of data. Objective measures in the session profile data comprised: the count of activities completed and goals achieved along with work activity timings and the number of interruptions; the discourse data from the video recordings also provided objective data. Other data in the session profile - the participation rating and the audio and visual ratings of the Skype sessions - were subjective, as were the views of the adults in the pre and post trial

questionnaires and the views of the child participants. The various data sources used are set out in Table 56.

Data Source	Data Type		Comments
	Subjective	Objective	
Activity count		✓	Objective data Session profile
Goals Achieved		✓	Objective data Session profile
Number of interruptions		✓	Objective data Session profile
Work activity timing = cost per minute		✓	Objective data
Audio rating	✓		Subjective data Session profile
Video rating	✓		Subjective data Session profile
Child Participant Rating	✓		Subjective Session profile
Questionnaire	✓		Subjective data
Interview	✓		Subjective data
Discourse data		✓	Objective data

Table 56: Data Sources

A session profile composite score was created for each Speech & Language Therapy session, combining four aspects that were examined for their level of acceptability – clinical activity, technology, participation (interaction) and cost – for both the Skype and Face-to-Face sessions; whilst this provided a systematic comparison of the two formats using the same data sources, no attempt was made to balance the four contributing scores. Consequently the maximum contribution to the composite score of the clinical activity and cost of providing the session was three but participation had a maximum score of 4 and technology had a maximum score of 10 (Table 30 page 139), thus weighting the contribution of each element unevenly. It is not necessarily the case that weighting these elements evenly would have been appropriate. However, it would have been better had some rubric for weighting been devised – for example, obtaining the views of the participants or therapists as to the relative importance of each of these factors and then weighting them accordingly.

This same issue reoccurs in the questionnaire data, with 8 as the maximum score on views of the technology but 14 as the maximum score for interaction, and 20 for

clinical activity (Table 32 page 147). Substantially different maximum scores were also present for the child participant interview data, allowing one aspect to potentially skew the combined score of overall acceptance of the Skype therapy sessions. In the interview data this bias came from the child's acceptance rating and in the questionnaire data the clinical activity.

In relation to statistical issues, the small number of participants ultimately limited analysis. The questionnaire and interview data were devised for the specific groups of participants, but the questions in both covered exactly the same topics, so it would have been possible to combine the two groups into a larger group. Combining the adult and child participants would have doubled the participant numbers in this research and increased the potential for statistically significant results.

Statistical significance – set at 0.05 - for any of the data collected in this research would not on its own prove using Skype was an acceptable delivery format for Speech and Language Therapy. Clinical significance is an interpretation of the data that could justify a change in practice in relation to such variables as therapy tools, frequency of sessions, and style of delivery. Clinical significance can be viewed as subjective (Pring, 2005) and does not necessarily follow on from statistically significant (or non-significant) research results; this may be because the results from a therapy approach are too small or too short lived or require an overwhelming amount of input to achieve the identified benefit. This could be considered the case with this research.

A greater number of participants might have increased the range of views and also the validity of the statistical analysis carried out in this research. This potential for improved statistical data would not only lead to a better understanding of how using Skype to provide Speech and Language Therapy can be acceptable but also gather information and opinions from more participants that could in turn identify additional benefits that would prompt changes in service provision. Such an evidence base would underpin the change in practice and the costs of changing a service delivery – equipment, personnel training and patient information.

In the course of this research potential benefits of using Skype to provide Speech and Language Therapy have been identified. These include the children being better focused and less distractible, working harder and using more instructions. These potential benefits require further research to identify the probability of the Skype service influencing the child behaviours - statistical significance – and also to then identify the minimum range of benefits – clinical significance - that would trigger the investment of resources to change Speech & Language Therapy services to use online desktop videoconferencing systems.

7.3 The Contribution of this Research

This research addressed a question beyond the obvious question of 'does therapy provided this way work?'. The research question was focused on the specific point of view of the therapist and focused on therapist concerns identified in the ASHA (2002) survey. It used the views of others – users and purchasers – and used more than one data source – session profile, questionnaire, interview, work activity/cost and discourse analysis data to address different aspects in the research question. This research adapted measures from previous research in this area – questionnaire, session profile and discourse analysis. The findings from this research challenge the perception of tele-technology from being just a convenient and cheaper alternative to providing F2F therapy, to being a therapy tool in its own right. The data have also provided guidance that other therapists could use in managing clients to keep them focused and also develop specific forms of expressive language.

There is a demand from the Department of Health (DOH) to 'provide more with less' (Middleton, 2012). Results from this research suggest that using tele-technology to provide equivalent therapy sessions can be achieved at less cost than F2F sessions because less time is needed for the peripheral activity required for F2F sessions i.e. preparation and setting up as well as travelling. However, the observations of the children and parents in this research chime with the recent DOH mission ' to provide more with less'. Their observations shifted the focus that using Skype was simply a more efficient way to deliver therapy to an additional view that using Skype facilitated successful therapy and was a tool to be used with additional problems associated with

attention and compliance as well as developing specific expressive and pragmatic language skills.

Two parents (9IM and 10JF) felt that their children were less distractible and better focused in the Skype session; these observations were investigated using the discourse analysis to substantiate them. Subtle changes were identified in the therapist's use of specific utterances in the Skype sessions – requests for joint attention, providing prompts, feedback and clarification; the change in the frequency of these utterance types was observed with the two participants (9IM and 10JF) who were most distractible in the F2F sessions; both of these participants completed more activities and goals in the Skype sessions. The therapist use of requests for joint attention and clarifications were the same for both participants; however, there were differences observed in the therapist use of feedback for each child. This observation would suggest that the therapy session provided using Skype facilitated more therapy gains for these participants and for children who would possibly be considered less able to access therapy through Skype because of their distractibility. Investigating the discourse of 9IM and 10JF with the therapist, identified differences in how the therapist managed the interaction and that the therapist not being physically present with the child did not limit compliance or focus.

The previous research projects using tele-technology to provide Speech and Language Therapy that formed the review for this thesis (Table 2 on page 36), have largely focused on a specific client group – clients with dysarthria, dysphasia, dysfluency, AAC, articulation, voice and dysphagia. Unlike the previous research, this project had no unifying characteristic common to all the participants nor was the therapy offered a standard prescribed programme. The majority of the previous research projects were experimental, one off projects that provided a therapy service that was not then adopted and continued beyond the research funding. Their experimental focus controlled the variables more precisely and focused on client groups where accurate measurement to compare assessment or treatment outcomes was possible; some had asked for the views of the participants using a one off questionnaire to ascertain acceptability of the remote therapy format but none used the observations from the

participants to investigate their data further and none of them used the questionnaire to identify any change in participant view with experience.

This research investigated the observations from the child interviews and adult questionnaires about working harder, producing longer sentences, touching the activities, being better focused with other data sources such as the session profile and discourse analysis. This research combined a wider range of measures than previous research project that had largely relied on a therapy outcome measure and for some a questionnaire or cost calculation. Just one of the previous studies analysed the interaction (Katsavarus, 2001) but only the sessions provided using tele-technology. The discourse data in this research was taken from a F2F and Skype session for each participant and used to compare the speakers in the two therapy situations but also used to examine the observations made by the participants in the questionnaire or interview.

This research used some of the same measures as others had previously used but adapted them. Previous research that had investigated costs (Katsavarus, 2001, Pierrakeas et al, 2005, Lewis et al, 2008) had evaluated set up costs or solely the session time itself (Lemaire et al, 2001); the current research focused on the running costs and considered the activity and more precise timing needed to provide any specific session which meant that all therapist work activity and running costs had to be collected for the whole trial period. Two other research projects (Styles, 2008, Tindall et al, 2008) had used the same questionnaire that had been originally designed for use with any participants accessing a health service through telemedicine (Yip et al, 2003). This was a questionnaire that had already been adapted by two therapy research teams for their clients and project but was further adapted so that the questions related to the therapist concerns with using tele-technology to provide a Speech and Language Therapy service. Unlike any of the previous research projects, the same questionnaire was presented twice to identify change in the participant views of the F2F and Skype therapy sessions.

The measures used in this research had expanded and refined those used by others in previous research – questionnaire, session profile, cost calculations; it involved three

perspectives – user (child participant), provider (therapist) and purchaser (adult participant). This research also adapted measures not previously used to research tele-technology – discourse analysis. All of the measures in this research have the potential to be adopted and used by other researchers investigating different aspects of providing online Speech and Language Therapy.

7.4 Future Directions

In the current economic climate there is a pressing need for Speech and Language Therapy services to maximise their resources – personnel and time – to meet the demand for therapy. To develop this option for any Speech and Language Therapy service in the UK will require research, professional guidelines and sharing of practical knowledge. Using video-conferencing and specifically low cost desktop video-conferencing such as Skype, could substantially change the way Speech and Language Therapy is provided in the future.

7.4.1 Professional Practice in the UK

Currently in the UK there are no specific professional guidelines on how video-conferencing and desktop computer technology can be used to provide any health service, let alone specific guidance for Speech and Language Therapy services. There is a need for the Royal College of Speech and Language Therapists (RCSLT), the professional body that represents Speech & Language Therapists in the UK, to establish appropriate guidelines for therapists working in the United Kingdom using the principles of evidence based practice, research, case studies and therapist experience and practice (Dollaghan, 2009). Unlike the Canadian Association of Speech and Language Pathologists (CASLP) who adopted ASHA Guidelines (2005) with no amendments, there are differences in how UK Speech and Language Therapy services are funded and organised that would require some consideration to address those anomalies; there have also been a number of advances in the technology; since the ASHA guidelines were written almost a decade ago, therapy services using tele-technology have been established working with a wider range of communication

impairments and client characteristics than ASHA guidelines initially anticipated would be feasible.

Guidelines should also incorporate the knowledge and skills that a therapist needs to use tele-technology competently to provide a Speech and Language Therapy service. Clarification on various aspects of governance which were not covered specifically in ASHA Technical Guidelines (2005) would need to be addressed – security issues relating to the use of email and desktop systems to share information, along with identifying the risks to data security whether written or verbal. The constant updating changes in the technology since ASHA (2005) guidelines were published suggest that services using tele-technology are facing new issues regularly and consequently guidelines will require regular and on-going action to monitor and update.

There has been a growing awareness of Speech and Language Therapy and the issues for the young communication impaired in the last four years, including recognition of the needs of the communication impaired and pressures on the Speech and Language Therapy profession in the Bercow Review (2008) and the year-long publicity and awareness campaigns 'Giving Voice' and 'Hello' in 2011. There is also an increased use of social media by professional organisations such as the RCSLT and individuals; social media chat is not limited to the UK but is worldwide and information can be rapidly disseminated. Despite public interest, for the most part, only the most complex forms of intervention such as electronic communication aids for the physically disabled or unusual cases, such as children who are selectively mute, get the media's attention, although more common Speech and Language Therapy services are more likely to provide benefit for a wider range of communication impairments and to a larger number of individuals.

With increased public awareness and expectation, even with ring-fenced budgets in the NHS, there is on-going pressure for Speech and Language Therapy teams to provide a quality service that meets demand. Tele-technology, and video-conferencing in particular, could provide the solution but to do this in the UK will require leadership from the professional body to demonstrate support for the use of technology in providing Speech and Language Therapy services through not only

establishing guidelines for its safe use but also promoting awareness of the technology and its use in providing Speech and Language Therapy services.

7.4.2 Future Research

Replication of this research is necessary to confirm the reliability of the research findings and conclusions. With eleven participants in this study, it is clearly important to evaluate more Skype and F2F Speech and Language Therapy sessions with more participants and involve more therapists; there has been more research using video-conferencing with the adult communication impaired and substantially less with a paediatric population. ASHA guidelines (2005), whilst useful in setting out the necessary considerations to manage such a service, includes candidacy criteria which were created with a small research evidence base and with limited clinical experience to draw upon; this may have inhibited the use of video-conferencing with children – the guidelines specifically advise against the use of this type of service with children under the age of five years as well as those with specific diagnoses such as Attention Deficit Hyperactive Disorder (ADHD) and those with impaired motor or cognitive skills that could hinder their ability to manage the technology. The data in this research have shown that attention and ability to focus can be supported using a video-conferencing link and may increase the number of goals and attention to each task despite having ADHD or any other difficulty holding their attention (Participants 7JM, 9IF and 10JF). This suggests that ASHA guidelines (2005) need to be re-evaluated and given that many more therapists are using video-conferencing than when ASHA carried out their survey in 2001, there will be a combination of more research and clinical experience to base revised professional guidelines on. Apart from increasing the clinical experience to shape professional guidelines, involving more therapists would widen the pool of therapist opinion and could be the start of establishing the competencies and knowledge base needed by therapists to work using tele-technology.

The limitations of this research have highlighted the need for more research with a differentiated paediatric communication impaired population with a sufficient number of participants in order that conclusions are definitive. Recruiting participants with the

same communication impairment, medical aetiology or age would increase our understanding of which patients can be best helped with Speech and Language Therapy through video-conferencing. Research that was specific to aetiologies, gender or age would add to the understanding of the advantages and drawbacks to Speech and Language Therapy provided remotely and identify which patient groups would be most likely to benefit from this service format as well as identifying the type of management and clinical activity enhanced using tele-technology. ASHA (2005) candidacy criteria would in turn become a more extensive and refined list based on clinical research.

Apart from the child's attention, other participant features emerged in this research that could also usefully be incorporated into future research and used to refine professional guidelines; features to evaluate include the level of familiarity that a participant has with the treating therapist, their expectations of therapy along with the level of computer competence needed to be able to manage the technology.

The differences in the interaction identified in this research suggested that the use of Skype prompted a different use of utterance functions making the Skype sessions useful as a therapeutic tool and not just a service delivery option. However, this was a tentative observation and would require more specific investigation to determine the unprompted changes in interaction that can be achieved when using Skype. Research with the same subjects working with the same activity in a F2F and Skype Speech and Language Therapy format would enable a direct comparison of the interaction. In this research only a few activities were recorded in the two session formats whilst future research would need to use a wider selection of activities controlled for clinical purpose and how much handling and other sensory information was involved.

The costs to provide the Speech and Language Therapy sessions using Skype were conclusive but just like the other aspects of this research need to be replicated. The methodology for the costs to provide was simple, focused on time and the costs that were unique to service delivery i.e. mileage costs and travel time. Future research needs to include the costs to the patient and their family such as printing materials, travel costs, email and computer costs – this was raised by two of the adult

participants (2JM and 10JF). This research did not evaluate the length of time or number of sessions needed to achieve specific patient goals – the focus in this research was on the amount of activity that could be achieved in a session; linking clinical efficacy to the costs of providing the F2F or Skype Speech and Language Therapy would require a matched control group working solely F2F with the same communication impairment, age and cognitive level and most importantly, the same therapy goals as a group of participants accessing their Speech and Language Therapy using Skype; a direct and controlled comparison between F2F and Skype provided Speech and Language Therapy would add the costs of efficacy and not just the potential efficiency that can be achieved providing Speech and Language Therapy service using Skype.

It is a decade since ASHA's survey (2002) and both professional practice and technology have changed in that time. Replicating the original survey in the UK would identify whether therapists in the UK have experience and knowledge of using tele-technology to provide health services and whether they share the anxieties reported in the American survey about remotely provided Speech and Language Therapy. Information from such a survey could enhance the guidance of those designing and implementing training to use video-conferencing to provide Speech and Language Therapy services.

7.4.3 Developing Speech and Language Therapy Services using Skype

A large part of this study was concerned with the setting up of the Speech and Language Therapy research service. This involved identifying the most appropriate video-conferencing system to use; establishing a protocol to introduce and also set up the Skype Speech and Language Therapy sessions for clients as well as managing the technical hitches in the actual sessions as well as adapting and creating materials to use in the Speech and Language Therapy sessions.

Sharing this practical knowledge is a priority to enable others in the profession to set up Speech and Language Therapy services that use tele-technology whether complex or simple. A training programme with on-going support and tangible materials to

support therapists would build up the confidence of others in the profession to use the technology but also generate additional ideas for its use as well as solutions and refinements to protocols and materials.

Whilst there has been increasing promotion and awareness of Speech and Language Therapy, there has been little or no information available on the benefits of using tele-technology to provide a solution to the increasing demand for Speech and Language Therapy – the consequence of the effective recent publicity. However, to get the information on this potential solution and therapeutic intervention more widely used, requires the therapists to be informed. There are three barriers to this currently. First, there is a great deal of ambiguity in the terminology used to describe services using tele-technology (Rogante, Grigioni, Cordella and Giacomozzi, 2010); terms such as tele-health, tele-care and tele-medicine are used interchangeably; the terminology needs clarification and any service provider needs to consider carefully which term best describes their service activity. Second, many of the studies researching tele-technology to provide Speech and Language Therapy services have been published in journals dedicated to Tele-care and Tele-health that are not typically accessed by Speech & Language Therapists so limiting the therapist awareness of how tele-technology is being used to deliver Speech and Language Therapy. Information about using tele-technology needs to be directed to therapists and feature in the journals that they are most likely to access – the RCSLT monthly magazine 'Bulletin' and its quarterly journal 'The international Journal of Language and Communication Disorders'. Third, there is currently no professional focus in the form of a Special Interest Group (SIG) supported with publications, training and materials.

The Speech and Language Therapy service developed in this study identified a continuing need to develop materials to use in the sessions, adapt assessments for use in remotely provided therapy and trial technology applications such as screen sharing. Unlike some of the other researched services, it has continued beyond the research trial period. Sharing the skills and knowledge gained is equally important through training, publication in journals, conference presentations, books and also social media to inform not just the profession but those that commission and fund as well as use Speech and Language Therapy services.

Setting up and developing Speech and Language Therapy services using tele-technology requires knowledge but it also requires determination and effort and this needs time and funding if using tele-technology is to become a part of mainstream Speech and Language Therapy services and a regular viable service delivery option. Spearheading interest in this service delivery option will require publicity – not just with patients but also therapists; it will require also an organised campaign that includes research to refine our knowledge and supported training to share knowledge and develop therapist skills and competence. All the points raised in this discussion would work towards this long term service delivery objective.

7.4.4 Wider Application of this research

Using Skype to provide therapy can help to identify the important factors about therapy itself for the client – interaction and relationship with the therapist, therapy outcomes, equipment – the technology and therapy materials, accessibility for the client and therapist, administration and change to working practice. Insight into the therapy process could facilitate control of these various aspects of the process to the advantage of the therapist and client.

The interaction was identified as crucial in the ASHA survey that investigated the use and attitudes towards using videoconferencing (ASHA, 2002). The therapist-patient relationship is considered to be a key component but is essentially subjective (Wootten, 2013, ASLTIP conference). However, it is not necessary to be in the same space to interact successfully with others and the data from this research showed subtle changes in the therapist style of interaction in response to the child when working with them using the Skype connection. None of the participants – adult or child – expressed specific concerns about being unable to interact with the therapist.

The outcomes that therapists focus on can be wide and varying (Roulstone, 2013, ASLTIP conference) and benefits may not be directly derived from the therapy goals in sessions alone. Withdrawing all the visual and kinaesthetic cues created a therapy scenario that required the child and therapist to rely on verbal language – both

processing and organising verbal information; using headphones helped further to reduce the potential for distraction in the child's own environment that for some children meant that they became less distractible and better focused on the therapy activities. All the child participants consistently completed more goals in the Skype than the F2F session; for some there was a perception that they were less distractible, less distracted by their sensory difficulties and that they had an increased level of compliance in the Skype session. With a reduction in the visual and kinaesthetic information, the focus of the activities in the session was pared down to verbal language; this suggests that the Skype sessions can provide a situation to develop language skills before extending those language skills to wider communication environments where there is visual and kinaesthetic information. Without the visual and kinaesthetic information, the Skype sessions facilitate the children to focus better and so support the observation from some adults and one child participant that they had to work harder in the Skype therapy session than the F2F session.

Developing a range of materials for use in the Skype therapy sessions took a substantial amount of time to develop and access to suitable materials would present an issue for other therapists seeking to develop a therapy service using Skype or an equivalent desktop video-conferencing system. Although some of the children identified the lack of holding the activities as a drawback, the adaptations that were made to the F2F equipment enabled activities to target more than one aspect of speech or language; as an example the Sudoku puzzles used in the F2F sessions to target processing of conditional language acquired an additional use when adapted for use in the Skype session – organising verbal instructions that used directional language.

Managing the technology was initially an issue for the research therapist because it was necessary to manage not only the therapist end but also the client end in some instances. Whilst the therapist has become more competent through practice so the use of Skype has increased and there has been less requirement to manage the client's end of the connection. However, it has become necessary for the therapist to keep abreast of an ever increasing range of other desktop video-conferencing systems to know and understand these systems, identify any advantages that they may have over

Skype; this could include less bandwidth requirement, better visual or audio acuity, screen sharing facility, greater privacy controls and compatibility with firewall and other computer protection systems

Working through a Skype link has required a number of changes to the therapy practice administration. It was vital that the therapist had effective time management skills, sending materials through email a few days in advance for preparation in a format that could be accessed by the child or rather the adults supporting them; this advance preparation also usefully acted as a reminder for the session appointment. The therapist needed also to be a competent computer user, able to design or adapt materials into a format that used the computer e.g. the reward certificates, store materials in the most appropriate format as well as confident to use the internet.

Asking others with the child to prepare materials as well as support and check the connection involved them with an active role in the session rather than just being a spectator as often can be the case in F2F therapy sessions and may account for the differences in the adult participant interaction in the two session formats. With materials demonstrated and access to reproducing them, support practice was immediately established with no wait for materials to be copied and sent. Email contact a few days before the session as well as directly after the session, meant that there was an increase in the contact with the therapist.

For different personal reasons the participants found the Skype sessions as successful as the F2F sessions and for some, additional advantages to the Skype session format could be identified beyond the obvious flexibility of scheduling sessions and limiting the logistic issues of travel; these advantages included increased focus, producing longer sentences, working harder, less distracted and more compliant. From the therapist point of view, the same amount of activity and goals could be achieved, adapting materials whilst time consuming produced equipment that doubled up with more than one therapy goal; timely contact prior to the session acted as a session reminder and increased the contact with families, providing increased opportunities for communication between therapist and family/client; the therapist was able to adapt her interaction, responding intuitively to the needs of the client in sessions, just

as would be expected in the F2F therapy session. The use of Skype to provide therapy in this research has shown that there are benefits that were not initially predicted in the Skype therapy format not simply a convenient less costly way to provide therapy service, but actually the most appropriate way to provide therapy for some clients.

7.5 The Final Word

Given the increasing demand for Speech and Language Therapy and the current financial pressures, alternative and more affordable ways to provide Speech and Language Therapy services need to be embraced by the profession in the UK. The ASHA survey (2002) not only identified therapist views but also their anxieties – highlighting the blocks to developing Speech and Language Therapy services provided remotely. Continuing to research remotely provided Speech and Language Therapy services whether they use dedicated video-conferencing or desktop computer systems, and establishing guidelines on professional practice and data security would set a benchmark that would protect patients and also service providers; sharing this information through publication and training would support individual therapists to use the technology to their service advantage. Research and dissemination of results combined with other knowledge transfer activity would contribute to establishing remotely provided Speech and Language Therapy services as an acceptable way to provide Speech and Language Therapy services - both as a service delivery solution and also as a therapeutic tool.

There have been large advances in the design and use of technology – not simply as a tool for work but as a tool for social communication with others not physically in the same space. The profession needs to adapt to and keep informed about the technology and how it changes communication skills in general as well as its potential use for service delivery and as a therapeutic tool. Previous arguments about acceptability are starting to be dated as more people adopt the technology for communication in their everyday lives. Meeting the challenges of demand with fewer resources should not be reactionary – the profession needs to think strategically and develop solutions for tomorrow and not just for today that are appropriate and

specific to the communication impaired individual. Using tele-technology to provide Speech and Language Therapy should be a part of that plan.

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List of Appendices

Appendix 1: Research Paper Rating Criteria

Scottish Intercollegiate Guidelines Network (SIGN) to rate different research papers

1. Systematic Reviews and Meta Analyses	
Aspect Grading Scale	
A	Well covered
B	Adequately addressed
C	Poorly addressed
D	Not addressed – not mentioned so aspect ignored
E	Not reported – mentioned but insufficient detail
F	Not applicable
Aspect	
I	Clearly focused question
Ii	Description of methodology included
Iii	Literature search is rigorous to identify all relevant studies
Iv	Study quality is assessed and taken into account
V	Similarities between the studies selected enables them to be combined
Methodological Quality Rating	
**	All or most of criteria are met; when criteria not absolutely met, conclusions or review are thought to be unlikely to alter
*	Some of the criteria have been met; those criteria that are not met or adequately described are thought unlike to alter the conclusions.
-	Few or no criteria met; the conclusion of the study are likely to alter.

2. Randomised Controlled Trials	
Aspect Grading Scale	
A	Well covered
B	Adequately addressed
C	Poorly addressed
D	Not addressed – not mentioned so aspect ignored
E	Not reported – mentioned but insufficient detail
F	Not applicable
Aspect	
I	Clearly focused question
Ii	Assignment of participants to treatment groups randomised
Iii	Adequate concealment used
Iv	Adequate blinding
V	Treatment and control groups similar at the start of trial
Vi	Difference between two groups is the treatment under investigation
Vii	Outcomes are measured in a standard valid and reliable way
Viii	Percentage Dropout
Ix	Subjects are analysed in allocated randomized groups
Methodological Quality Rating	
**	All or most of criteria are met; when criteria not absolutely met, conclusions or review are thought to be unlikely to alter
*	Some of the criteria have been met; those criteria that are not met or adequately described are thought unlike to alter the conclusions.
-	Few or no criteria met; the conclusion of the study are likely to alter.

Scottish Intercollegiate Guidelines Network (SIGN) to rate different research papers

3. Cohort Studies	
Aspect Grading Scale	
A	Well covered
B	Adequately addressed
C	Poorly addressed
D	Not addressed – not mentioned so aspect ignored
E	Not reported – mentioned but insufficient detail
F	Not applicable
Aspect	
I	Clearly focused question
Ii	Groups being studies are selected from comparable populations
Iii	Number of participants asked to participate clear
Iv	Participants with outcome at time of enrolment calculated
V	Percentage of participants dropping out before study completed
Vi	Comparison of participants that completed and dropped out made
Vii	Outcomes clearly defined
Viii	Adequate blinding
Ix	If blinding not used, knowledge of exposure status accounted for
X	Exposure assessment is reliable
Xi	Evidence from other sources used to demonstrate that the outcome method is valid
Xii	Independent assessment
Xiii	Potential confounders are identified
Xiv	Confidence intervals provided
Methodological Quality Rating	
**	All or most of criteria are met; when criteria not absolutely met, conclusions or review are thought to be unlikely to alter
*	Some of the criteria have been met; those criteria that are not met or adequately described are thought unlike to alter the conclusions.
-	Few or no criteria met; the conclusions of the study are likely to alter.

Scottish Intercollegiate Guidelines Network (SIGN) to rate different research papers

4. Case Control Studies	
Aspect Grading Scale	
A	Well covered
B	Adequately addressed
C	Poorly addressed
D	Not addressed – not mentioned so aspect ignored
E	Not reported – mentioned but insufficient detail
F	Not applicable
Aspect	
I	Clearly focused question
Ii	Participants and controls taken from comparable populations
Iii	Same exclusion criteria used for participants and control groups
Iv	Percentage participants involved
V	Comparison of participant and control populations
Vi	Cases are clearly defined
Vii	Clearly established that controls are non cases
Viii	Prevention measures to limit knowledge
Ix	Exposure status is measured in valid and reliable way
X	Main confounders are identified
Xi	Confidence intervals are provided
Methodological Quality Rating	
**	All or most of criteria are met; when criteria not absolutely met, conclusions or review are thought to be unlikely to alter
*	Some of the criteria have been met; those criteria that are not met or adequately described are thought unlike to alter the conclusions.
-	Few or no criteria met; the conclusions of the study are likely to alter.

Appendix 2: Skype Training Manual

Making a call using Skype

Setting up

1. Set up computer on a level surface.
   Switch on.
2. Plug in headphones including microphone.

3. Set up camera and position – in the midline and in direction of the computer screen; don't block the microphone.
   Plug into the USB port.
   Double click on the web cam programme (Logitech quick cam).
   Check that the camera is active – double click on film icon and a red light should appear on the camera and your picture should appear on the screen; close this screen.
   Check that the microphone is active – double click on gears icon and then onto the icon of a microphone; select the Logitech microphone option. You will know that the microphone is active, as the volume bar will move in response to your speech. Minimise the Logitech programme.

4. Double click Skype.
   Take a breath – it tells you to do so.
   Log in with your user name and password

5. Check the sound is working
   Click on the search box – at the bottom of the page – and then type in 'Echo123'.
   Follow the instructions as directed

Ready to Dial

1. With the Skype page open click onto contacts
2. Click search box (blue and at the bottom of the page)
3. Type 'speechsort' and press enter – you should hear a tone and a message on the screen to tell you the status of your phone call

You can save 'speechsort' as a contact.
You then can click on the icon to make the call

Receiving an Incoming Call

1. Click on the green phone button to accept.
2. Turn up the volume on the computer.
3. Click on the video icon to start and show up your picture
4. Scroll over Rebecca/Speechsort and click Full Screen

Ending a Call

1. Move the mouse and icons should appear.
2. Click on the red icon to end the call.
3. Click on the red X to close the Skype programme.

Finishing off a Skype Session Checklist

	Action to Take *(tick as completed)*	✓
1	To end session click on red phone to close	
2	Close down Skype	
3	Unplug webcam	
4	Unplug headset	
5	Check email for session plan summary from Rebecca	

Troubleshooting

	What to do if …..	Action to take…….
1	Can't hear Rebecca	Plug in your headset before you start Skype. If you have started Skype, quit and restart.
2	Can't see Rebecca	Close Skype; plug in the webcam and then restart Skype
3	Rebecca can't hear me	Check you have your headset/microphone device selected in your Skype settings. Check your headphone/microphone jacks are plugged into the right audio in and audio out sockets on your computer. Check your microphone works – choose Tools – options – sound devices and deselect the check box next to Let Skype Adjust My Sound Device settings. Check the volume – choose start – settings – control panel – sounds & audio devices; check the audio tab to open the sound recording window and click the volume button and use your mouse to slide the volume slide to a louder setting.
4	Rebecca can't see me	Make sure that your webcam is plugged in; you may have to close Skype and plug the webcam in before restarting again.
5	The picture freezes	Can happen with a laptop overheating. Advise Rebecca of the problem and disconnect call and then she will ring you to reconnect. Useful to place laptop on a plastic box so that the heat can escape away from the laptop.
6	The connection is lost	This can happen **Wait for Rebecca to ring again; then click on answer icon (green telephone)**
7	I hear an echo	This should not occur if Rebecca is wearing her headphones but it can occur if she is not. Ask her to wear her headphones
8	I forget my Skype password	Go to: www.skype.com/go/forgotpassoword and fill in the form.

Technique Pointers

Aspect	Tips
Location	Make sure that your in a room that is comfortable for both of you
Lighting	Block out daylight if at all possible Switch on lighting that is above you
Sound	Feedback can be reduced by both of us wearing headphones
Positioning	Position camera above the computer screen if possible to aid eye contact Place toy character on the webcam to encourage/remind child to look at the camera when speaking
Talking	If you have something urgent to say raise your hand to indicate that you want to speak

Making these tips specific to you

Location	
Lighting	
Sound	
Positioning	
Talking	

Appendix 3: Sample of Completed Typical Face-to-Face Session Plan

Session Plan

Date of Session: 25th October 2012
Name of Client: [redacted]
Therapist: Rebecca Matthews
Venue: [redacted]'s school

	Goal/Activity	Achieved
1	Organise the sequence of activities for the session	
2	Ask about the last week Set up one of his pictures on the ipad with hotspots ✓	2 pictures
	Descriptive Vocabulary • Colours • Size • Texture (sense of touch)	Excellent often own words contribution to audio
	Attention/Listening Skills • Audio tape to target = (4) audio workout (app) okay lost one part of info * • Memory Game	
	Language – understanding • Most and least • Between/in the middle + below • Before • Match rather than same (3) ie "Find the * large dog that is sleeping" Category carousel = grouping VERY good & quick (music/jobs) good reliable answers & independent ones too	
	Social – Theory of Mind (5) • Strategy game Downfall ↓ reinforced "all except" rule on what/what to use	
	Language – expressive and use of (6) * Asking Questions → prompts needed to invert subject & verb ie "Is it X?" • Directions/Instructions Numberhase * Reliable yes/no answers ↳ okay; reliable verbal yes/no responses on some questions ie 60% of time.	

Other Action + observations
lee chewing on the chewey tubes today

Reward & Feedback Golden points offered	[redacted]	greeted spontaneously said goodbye sat well } with sound/gesture prompts
Present	RM + [redacted] + Mrs	(LSA)
[redacted]	SENCO Feedback	
TLP	Swop discs next week	Not today
	Review and write in Therapist Diary	
Next Session	8th November	

Signed: Rebecca Matthews
Rebecca Matthews, BSc (Hons), MSc, CertMRCSLT, MASLTIP, reg HPC

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Appendix 4: Example of Skype Session Reward Certificate

This is to certify that

Speech Sort

XXXXXXXXX

did very well with his first playing of Mastermind and organised me with the colours clearly!

Signed: Rebecca A. Matthews

Date: 18th May 2011

Appendix 5:First UCL Ethics Application Research Outline

Please provide a brief summary of the project in lay terms outlining the intended value of the project, giving necessary scientific background. *(max 500 words).*

Videoconferencing has been available for two decades and has been used to provide various healthcare services, which have included Speech & Language Therapy. The use of videoconferencing technology to provide Speech and Language Therapy has been sporadic and currently there is only one Speech and Language Therapy service in the UK that uses this technology.

Since the first published study in 1987 there have been 13 researched Speech and Language Therapy services using videoconferencing. The majority have been based in North America with a few in Australia and just four in the UK. Eight of these services have been for adults who have an acquired/neurological aetiology, voice difficulty or stutter; just five have involved children; nine of these thirteen services have provided assessment and liaison only; four have provided on-going therapy using two very specific therapy programmes following a prescribed format. The four UK studies have reported positive outcomes and benefits. Whilst they report interest this has not led to a wider use of videoconferencing technology to provide Speech and Language Therapy services in the UK and only one of these UK projects continues to use videoconferencing technology.

There has been wider use of videoconferencing technology reported to share specialist teachers between secondary schools that are too far from each other to make travelling a practical way for pupils to access specialist subjects. Speech and Language Therapy is in many parts of the UK a scarce and specialist resource – it is quoted that one in ten children needs Speech and Language Therapy. The demand for Speech and Language Therapy continues to outstrip the available therapy time; the reasons for this include increased demand through greater awareness of Speech and Language Therapy, staff shortages, clinical time used for travelling, patients unable to access and Speech and Language Therapy because of its location or timetabling.

The cost of the videoconferencing units to ensure good picture and sound quality has been prohibitive in the past. Computers are more affordable & widely available in schools as is videoconferencing technology that is affordable and of good quality. Some educational establishments already use desktop videoconferencing to provide tutorial and individual support.

Videoconferencing could provide part of the solution to making Speech and Language Therapy more available. It has the potential to create more clinical time as travelling time could be reduced; it is now more readily accessible & offers flexibility in appointment times as children could be seen at home or in school without the complications of school schedules and transport; the costs associated with videoconferencing have reduced and the quality of sound and picture also improved so making desktop videoconferencing a viable alternative to the traditional fixed and expensive videoconferencing units. It is however only an alternative if Speech and Language Therapy can be provided using this 'off the shelf' technology. Unlike the previous studies, this research project would focus on providing Speech and Language Therapy for children using desk top videoconferencing to answer that question and also identify the parameters that would indicate or preclude success as well as identifying changes and modifications necessary to provide Speech and Language Therapy this way.

Briefly characterise in lay terms the research protocol, type of procedure and/or research methodology (e.g. observational, survey research, experimental). Give details of any samples or measurements to be taken *(max 1000 words).*

This research project would use desk top videoconferencing technology to provide Speech and Language Therapy sessions for children aged between 5 and 18 years of age who currently have face to face sessions on a regular basis with an Independent Speech and Language Therapist who travels to work with them either at their school or home. The children on the caseload of this specific Speech and Language Therapist have a range of different communication difficulties:

1. difficulties in producing sounds (articulation)
2. unintelligible speech through sound substitution (phonological)
3. failure to understand what is said to them (receptive language) including memory and listening difficulties
4. difficulty in expressing themselves verbally (expressive language) including grammar, word finding
5. finding language difficult to use appropriately (pragmatic).

The degree of severity is wide ranging – some of the children have long term needs; 50% of the current caseload have a Statement of Educational Need (SEN). The children have a wide variety of medical aetiologies ranging from autism/ASD and Asperger's to Cerebral Palsy, cleft palate, dyspraxia, hearing impairment and specific language impairment.

The children recruited to participate in the study would be involved in this new service delivery – up to two school terms. To be involved in this research the children would have to meet three criteria:

1. aged between 5 and 18 years of age
2. can attend to Speech and Language Therapy tasks in an hour long face to face session
3. have the necessary support of their school and families to access and manage the videoconferencing process.

The families of those children that meet these criteria would be invited to participate with a discussion on the project and an information sheet along with a consent form; there would also be an equivalent information sheet relevant to the child's age for the child participant to view and the option to discuss the new approach. To ensure that the families would not be disadvantaged by the online approach, additional sessions with no charge would be offered to alleviate any concerns that the usual progress might not be met. Those families that are not involved in the online Speech and Language Therapy would be invited to be part of the control group -

One online and one face-to-face session would be video-recorded with the agreement of the child participant; the recording would focus on the therapist. After a few online sessions the child participant would be interviewed using a specific range of questions that would cover their experience of computers, their impression on the picture and sound quality as well as their views using the online and face to face therapy sessions. At the same point the adult participant supporting the online sessions would be given a questionnaire to complete covering similar aspects as the child's interview. If this adult participant is not a family member then they will be asked to complete a similar but modified questionnaire to ascertain their views on the online approach. The control group would be unaware of any active involvement in the research as their goals would be evaluated over the same period of time or equivalent number of sessions as any of the children enjoying the online sessions for comparison. If possible children would be matched for age and aetiology.

The student researcher is also the Speech & Language Therapist but would be expected to carryout activities that would enable on-going, quantifiable data collection to be accurate. These activities include:

1. Identify goals for each child
2. Rate progress using goal achievement scaling
3. Identify the activities for each goal that can be provided using online technology
4. Modify the activities that cannot easily transfer to online format
5. Complete modified session plans that specify number and length of interruptions, rate the audio and visual quality of sessions
6. Complete a timesheet record throughout the research period listing time spent on each activity
7. Record any observations in either session format

The research seeks to answer the question – Speech and Language Therapy sessions for children can be provided through desktop videoconferencing technology. Many of the researched Speech and Language Therapy services have not identified the cost benefit to the patient (Hill & Theodoros, 2002). Previous studies have focused solely on outcome measures and did not consider the technology alongside any identified patient benefits.

With this in mind the primary research question will consider two aspects - firstly the technology (Yawn, 2000) and secondly the Speech and Language Therapy process. The table below specifies the measures to evaluate these two aspects and the ten measures to be used to make a cost benefit analysis. The research methodology to be used is both quantitative and qualitative using observation, field notes, interview and questionnaire.

1	**Investigating the Technology**	
	Measure	**Methodology**
a	Identify range of Therapy activities carried out in a session and technical requirements	Audit of Speech and Language Therapy activity across 5 parameters (Yawn 2000)
b	What breaks/interruptions in service?	Observation – recording number and time taken on session plan
c	What % goals can be addressed online?	Session Plan comparison between face to face and online sessions
d	Competency and confidence of parent/teaching team (adult)	Questionnaire
e	Competency and confidence of the child to use the technology	Interview (audio/video recording to transcribe responses)

2	**Investigating the Speech & Language Therapy**	
	Measure	**Methodology**
a	Evaluating progress to achieve Speech and Language Therapy goals	Goal Achievement Scale to quantify progress and make comparison between the different participants
b	Comparison of time spent and activity between the online working day and the face to face working day	Therapist Timesheet
c	View on the range of activities, how it felt, changes that can be identified by parent/teaching team (adult)	Questionnaire
d	View on the range of activities, how it felt, changes that can be identified by the child	Interview (audio/video recording to transcribe responses)
e	Comparison in the language of the therapist when face to face and online	Video recording Observation and conversation analysis

Appendix 6: Key Amendments in Application to extend UCL Ethics Approval

Summarise the issues contained in the amendment

The following parts of the project have been amended as a result of further reading, consultation with others within & outside of UCL, trialling the data collection and the views of the participants in this pilot:

Information Sheet – now presented as an A5 leaflet as well. (attachment 1)
Timeline – additional information sheet; provides an overview of the project and how the participant fits in. (attachment 2)
Information/consent Letter – reduction in fees easier to understand and being applicable to both types of session, online or face-to-face, reduces the potential for bias in adult participant views. (attachment 3)
Consent form – layout with requirement for each item to be initialled. (attachment 4)
Questionnaire – reformed & based on previously validated research project assessing telemedicine (Yip, Chang, Chan and MacKenzie, 2003). It is proposed to present the questionnaire twice to the adult participants and a request for a follow up interview possibility to enable clarification on their answers. (attachments 5 and 6)
Interview – reformed with questions in line with adult participant questionnaire; no change to protocol. (attachment 7)
Discourse analysis - form developed and modified to log various aspects of interaction that have been identified from other research as potentially likely to change. (attachment 8)
Timesheet - form amended to identify how time is used at clinic base and on the road (attachment 9)
Session plan - form amended to capture relevant information typically recorded in session plans and rate the sessions; information to collect includes number and length of interruptions, bandwidth (online sessions only), number of aims/goals achieved and number of activities carried out, timing of the whole session, views from the child and adult participant on the visual, auditory, and interaction in that session. These will be used for both types of session. (attachment 10)
Change of use in materials - a systematic approach has been followed to record change in the use of the equipment and also a log of the adaptations that were made.

Please give any other information you feel may be necessary:

1. The pilot study has established a training protocol to introduce and secure competent use of the videoconferencing system; it has also established the necessary and appropriate administration such as equipment loan forms and reward certificates
2. The pilot study has been the opportunity to refine the research format – what is useful and also what is workable.
3. It has been invaluable to take on board views of users from the starting point of discussing the research, providing an incentive for their involvement, providing clear and easier to understand information.
4. Starting to develop a formal log of the adaptations of materials and realising their potential to enable the Speech & Language Therapy work in an online setting.
5. A solution to video-recording the online session has been resolved with a downloaded programme onto the therapist's computer.
6. The need to have others validate the data analysis is readily appreciated for the discourse analysis in particular. Instructions and a protocol are being developed to ensure that validation can be carried out using other therapists/linguistic students.
7. The three participants involved in the pilot study have been supportive and positive in their support and comments; the family who had to drop out, remain keen to trial the online sessions with their child.

Appendix 7: Main Study Participant Invitation letter

Rebecca Matthews
Independent Speech & Language Therapist
UCL Doctoral Research Student

c/o Heathercote House
Silchester, Reading, Berkshire, RG7 2PG
Tel: 0118 9700300
Fax: 0118 9700300
Email: sslyram@ucl.ac.uk or Speechsort@btinternet.com

Date

Dear

You will have been aware from my annual newsletter that I am studying for a Doctorate in Speech & Language Therapy at University College London and that I have chosen to investigate using videoconferencing to provide Speech & Language Therapy sessions, I am writing to ask if you would consider allowing your child to participate in this research.

The enclosed Summary Information Leaflet explains the purpose of the research and how the videoconferencing will be used. I am also enclosing a Timeline to illustrate how the research activity will work out. There will be no change to the number or the length of sessions that you child currently has with me; sessions will not be exclusively videoconferencing but alternate between face-to-face and videoconferencing.

Should you feel – for whatever reason – unhappy about the sessions run through videoconferencing, having agreed to participate in them, then you can ask that we have face-to-face sessions just as you have currently for your child.

For the duration of the research there will be a reduction in the fees charged for both the face-to-face and videoconferencing sessions so that 30 minute sessions will be charged at £30 and hour long sessions will be charged at £50.

If there is anything that is not clear in the Summary Information Leaflet or my letter then please do not hesitate to discuss. I have also enclosed an explanatory letter for your child to read that explains what they would be involved in and be asked to do.

Yours truly,

Rebecca Matthews
BSc (Hons), MSc, regHPC, cert MRCSLT, MASLTIP
Independent Speech & Language Therapist
UCL Doctoral Research Student

Enc: Research Summary Leaflet
Participant Information Timeline
Research Information Sheet for your child
Consent Form and SAE

Appendix 8: Revised Participant Consent Form

Using videoconferencing to provide Speech & Language Therapy
This study has been approved by the UCL Research Ethics Committee

Name of Child: Please initial box to indicate consent

1. I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I confirm that I have received satisfactory answers to all my questions or have been advised of an individual to contact for answers to pertinent questions about the research & my rights as a participant and whom to contact in the event of a research- related injury. ☐
3. I agree to my child being interviewed, in my presence, about the Skype sessions. ☐
4. I agree also to complete two questionnaires about the Skype & face-to-face Speech and Language Therapy sessions. ☐
5. I understand that some of my child's Therapy sessions will be video-recorded and I am aware of and consent to, any use you intend to make of the recordings after the end of the project ☐
6. I agree to be contacted in the future by UCL researchers who would like to invite me to participate in a follow-up study. ☐
7. I understand that the information I have submitted will be published as a report and I will be sent a copy. Confidentiality & anonymity will be maintained & it will not be possible to identify my child from any publications. ☐

I understand that I am free to withdraw my child from the study without penalty if I so wish. I consent to the processing of my child's personal information for the purposes of this study only and that it will not be used for any other purpose. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Signed: Date:

Name of Parent:

Investigator's Statement

I, Rebecca Matthews confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonably foreseeable risks or benefits.

Signed: Date:

Appendix 9: Revised Research Summary Leaflet Wording

Videoconferencing is a form of tele-technology; tele-therapy is the use of tele-technology – phone, fax, email & internet as well as videoconferencing – to provide a therapy service. There are a variety of activities involved in providing a therapy service & these include assessment & diagnosis, liaison with families and other agencies as well as actual therapy sessions.

For the last 30 years various forms of tele-technology have been used to provide Speech & Language Therapy to patients unable to access Therapy in the usual format or location. The research outcomes have been positive including those Speech and Language Therapy services that have used videoconferencing technology. However, despite identified benefits and the increased demand for Speech and Language Therapy services, the use of videoconferencing technology to provide Speech and Language Therapy remains limited.

The American professional body for Speech and Language Therapists (ASHA) investigated attitudes of their membership to using videoconferencing using a questionnaire in 2001. A number of concerns were identified including the following:

- loss of rapport with patients
- costs to set up and run
- technological know how and support
- lack of training

With these concerns in mind Speech and Language Therapy service has been set up that combines both face to face and videoconferencing as part of the therapy service to ensure that rapport is not compromised; the service uses a desktop videoconferencing service – Skype – which uses off the shelf webcam & headsets so reducing costs and increasing accessibility; the Skype service has online support and has been designed for ease of use but the therapist has developed a training package that can be adapted to the specific user.

<u>Research Question</u>

What changes in the use of therapy materials, therapist's time and clinical interaction can be identified when Speech and Language Therapy sessions are provided face to face & using Skype videoconferencing technology.

<u>Measures</u>

This research will measure three aspects of the Speech and Language Therapy service with a combination of quantifiable and qualitative data.

1. Materials

All the equipment that the therapist uses will be individually evaluated. Each item of equipment will be described and the sensory & motor skills needed to use it also listed; its therapeutic uses will be identified when used in traditional face to face sessions and then compared to how it was used in the Skype sessions; it is anticipated that the various pieces of equipment will need to be adapted and these adaptations will be recorded in a diary format and costs to produce the adapted equipment specified.

2. Therapist's Time

The therapist's work activity will be recorded to identify what activity is carried out when the therapist is in the clinic base providing sessions through Skype & when visiting patients in their location. Mileage and running costs of a car will be recorded alongside the costs associated with running a clinic.

3. Clinical Interaction

Two sessions will be video-recorded – one recording will be a face-to-face session and the other will be a Skype session. The interaction between the therapist and the child & any other adult will be analysed in each recording for the following:

- Number of therapist/child/other adult utterances
- Length of utterances
- Number of repetitions requested & unprompted
- Number of interruptions
- Number of therapist/child/other adult initiations
- Type of utterance
- Communication mode – verbal, gesture, written

A comparison between face to face and Skype sessions will be made.

Participants

Children who are involved in this research must meet the following criteria set out by the American Speech and Language Therapy professional body (ASHA):

- Over 5 years of age
- Able to attend to a 30 minute face to face Speech and Language Therapy session
- Use of a computer with internet access

Any child and family that find the Skype sessions uncomfortable or not satisfactory will be able to return to having solely face-to-face sessions without any penalty.

Participant Involvement

Once a child and their family have agreed to participate in the research and have signed a consent form, they will be helped to set up a Skype account & loaned the necessary equipment; there are no charges made for calls between Skype accounts so no extra costs will be made to you; a call will be made, without the child, to establish the Skype link.

It is anticipated that ten sessions – a combination of face to face and Skype will be possible. The Skype sessions will be available on Wednesday, Friday or Saturday and any weekday evening.

All adults involved in or supporting the Speech and Language Therapy sessions will be asked to complete a questionnaire as the Skype sessions commence; after 4th Skype session the same adults will be asked to complete another questionnaire and invited to share their views on both the Skype and face to face sessions in an interview; the child participants will be asked to share their views in a video-recorded interview also at this point. After three Skype sessions one face to face & one Skype session will be video-recorded.

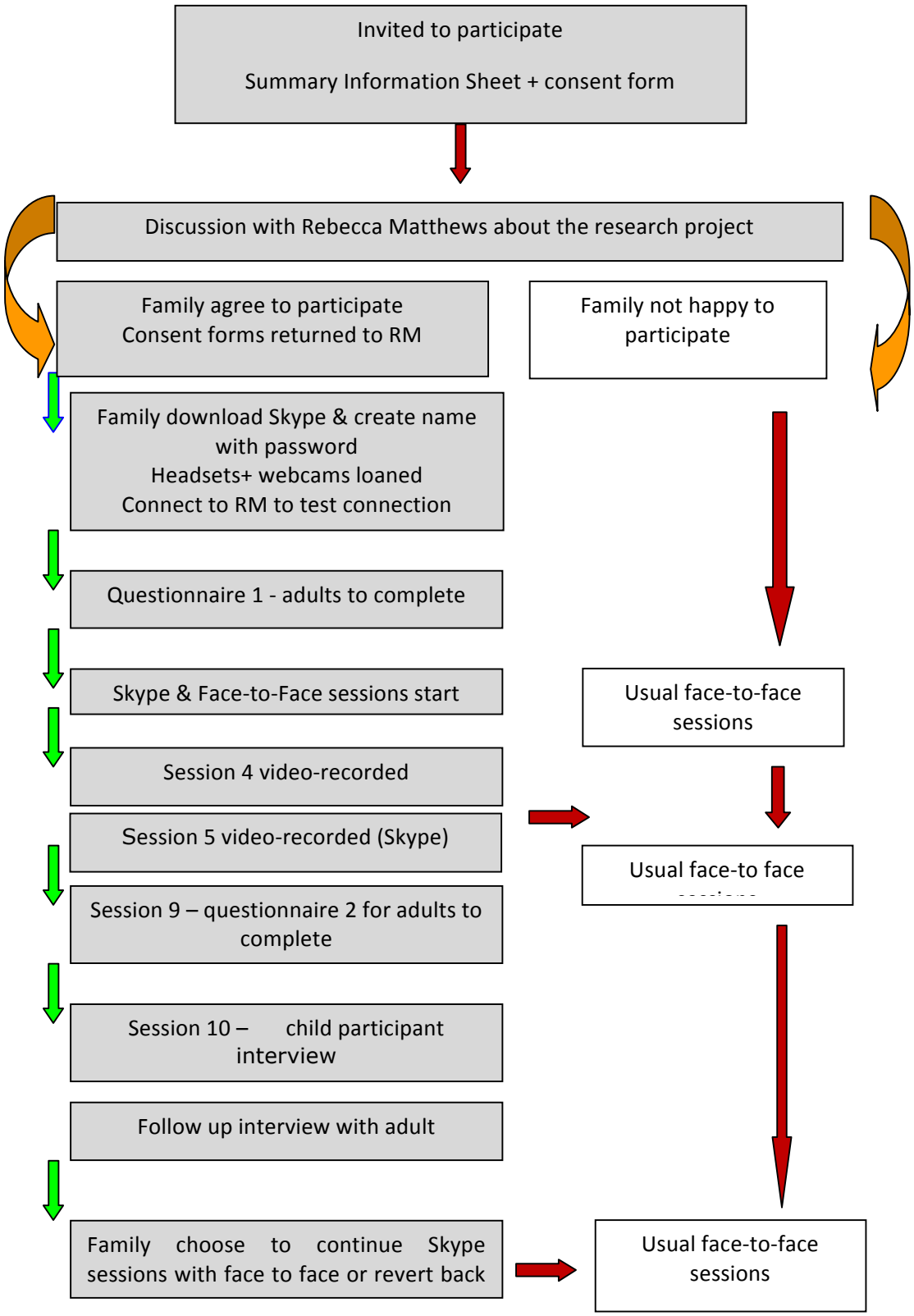
All recordings would be stored in a locked filing cabinet and your express permission sought to play or use the video recording. All data will be collected and stored in accordance with the Data Protection Act 1998.

It is up to a family to decide whether or not to take part in this research. If a family chooses not to participate it will involve no penalty or reduction or change to the current level of Speech and Language Therapy sessions that are currently provided for the child. I can confirm that if having decided to take part a family feel that the sessions through the desktop videoconferencing are not working well that they would still be free to withdraw at any time and without giving a reason.

As the research period ends the families will be offered the choice to continue with the Skype and face-to-face sessions or if preferred revert to face-to-face sessions.

Appendix 10: Participant Information Timeline

Timeline Flow Chart



Using videoconferencing to provide Speech and Language Therapy
Rebecca Matthews – Tel @ 01189700300 – Email @ Speechsort@btinternet.com
April 2009

Heathercote House, Silchester Common,
Reading, Berks., RG7 2PG.
Tel/Fax: 0118 9700300
Mobile: 0776 494 4917
Email: speechsort@btinternet.com

Dear

I am asking you to help me try out a new way to have our sessions. I shall come and see you some weeks at home or school like I do now.

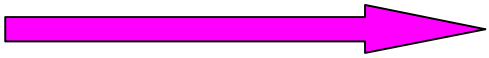
For some of our sessions we shall work with each other using our computers instead.

Rebecca's computer

Your computer

We shall see each other on our own computers. There will be a camera that will send a picture of you to my computer and my computer camera will send you a picture of me so that we shall be able to see each other.

My camera



Your computer

You will be able to see yourself on your computer at the same time that you see me! We shall wear headphones so that we can hear each other.

We shall do all our usual games and the colouring sheets will be in the post to you.

Instead of giving you a sticker I shall send you a certificate through the computer.

I shall ask you some questions so that you can tell me what you think about our sessions on the computer and I shall write down your answers to help me.

Two of our sessions will be recorded so that I can watch and see what we do when we are talking to each other.

If you don't like our sessions on the computer then you just have to tell Mum and we can stop and have all our sessions at home just as we usually do.

I am really looking forward to working with you on the computer.

Rebecca

Appendix 11: Participant Information Letter – Junior

Heathercote House, Silchester Common,
Reading, Berks., RG7 2PG.
Tel/Fax: 0118 9700300
Mobile: 0776 494 4917
Email: speechsort@btinternet.com

Dear

We are going to try some of our sessions using the computer to see and hear each other but we shall not be in the same room together!

We shall still do our usual games and activities – you will be able to see me on your computer and a small picture of yourself too. I shall send you a certificate through the computer for your good work instead of giving you a sticker and also my session report to Mum and Dad and your teachers.

For every session that you see me on the computer, I shall come and see you at school. If you do not like the session we have on the computer then you can tell Mum, Dad or me and we can have our sessions how they used to be.

I should like to record two of our sessions using my video camera so that I can look at how we talk to each other and check that our work is still good.

I should like to ask what you think about our sessions on the computer. I shall come and see you another time to ask you about it. Your answers will be very interesting and very valuable to me.

I shall be able to answer your questions next time I see you and I am looking forward to working with you through our computers.

Mrs Matthews

Appendix 11: Participant Information Letter - Teenager

Heathercote House, Silchester Common,
Reading, Berks., RG7 2PG.
Tel/Fax: 0118 9700300
Mobile: 0776 494 4917
Email: speechsort@btinternet.com

Dear

We are going to organise our sessions differently for the next term. Half our sessions will be face-to-face like they are now but for the remainder we shall use our computers. We shall see and hear each other on our computers using videoconferencing to make contact.

We shall carry out all of our usual activities and I shall email a session plan at the end of the session so that you have a copy to take home and also to give to your teachers. I shall still be able to recommend merits for your work in our session if deserved just as I do now.

At some point I shall want to ask you about this new format for our sessions so we shall set aside some time for me to visit and ask questions and for you to give me your answers. I should also like to record two of our sessions using my video camera so that I can look at how we speak with each other using the computer.

If you do not like our sessions using the computer then you can ask either your parents or I if we can have our face-to-face sessions only. It will not be a problem to change back.

Your help will be very important and necessary and could improve services for other children and young people needing Speech & Language Therapy. I hope that it will be interesting to you too.

I am looking forward to working with you in this way. If you have any questions please do ask me when I next see you or you can email or phone me with your parent's permission.

Mrs Matthews

Appendix 12: Amended Work Activity Timesheet

1	Date	10th Sept 2009	
2	Number of patients seen	5	
3	Start time	8:05 am	
4	End time	19.15pm	
5	Minutes on the road	670 mins	
6	Minutes worked at base	75 mins	
7	Total minutes of work	A = 745 mins	
8	Miles travelled	91 miles	
9	Total cost of travelling (Xp per mile * miles travelled)		
	ACTIVITY	ROAD	BASE
10	Planning session plans		45
11a	Prep of equipment for today		30
11b	Prep of equipment for tomorrow		
12	Therapy	145	
13	Writing up session plan/notes	25	
14	Report writing		
15a	Liaison – phone calls	20	
15b	Liaison – email		
15c	Liaison – face to face	55	
15d	Liaison – letter		
	Total	B1 = 245	B2 = 75
	Combined Total	B3 = 320 mins	
16	Equipment		
17	CPD		
18	Miscellaneous admin tasks		
19	Accounts		
	Total	C1 = 0	C2 = 0
	Combined Total	C3 = 0	
20	Travelling Time	172 mins	
21	Set up/Pack up Time	65 mins	
	Total	D = 237 mins	
22	Lost Time = A – (B3 +C3 +D)	745 –(320 + 237) = 188	
23	Clinical Time = B3	B3 = 320 mins	
24	Travel Costs		
25	Other Costs		
26	Earnings	£280.00	

Comments – weather/travel conditions/cancellations/

Appendix 13: Main Study Pre Trial Questionnaire

Participant Number:

It is much appreciated if you could complete this questionnaire, which should take around 30 minutes to complete. Your additional views are much appreciated and if you wish to expand any of your answers then please use the reverse side of the questionnaire. If there is any difficulty in completing the questionnaire then please contact Rebecca Matthews on 0118 9700300 or 0118 9701893.

1. How many hours in a week do you use a computer?
(Please tick one box only)

☐ < 5 hours ☐ 5 – 10 hours ☐ 11 – 20 hours ☐ >20 hours

2. Where do you access a computer? (Please tick all the boxes that apply)

School ☐

Home ☐

Internet cafe ☐

Library ☐

Work Place ☐

Other (please specify) ☐

3. What do you use a computer for? (Please tick all the boxes that apply)

Writing letters ☐

Shopping ☐

Searching for information ☐

Managing money ☐

Work ☐

Entertainment ☐

Other (Please specify) ☐

4. How would you rate your skill in using a computer?
(Please circle your response)

Unable to use computer — very experienced

1 2 3 4 5 6 7

5. Have you used videoconferencing including Skype before being involved in this research? (Please circle your response)

Yes No

If you have any comments or other observations about your competence in using a computer that you feel would be relevant then please add them here.

6. The following questions are focused on how you think the technology will make the Skype Speech & Language Therapy sessions the same or different from face-to-face Speech & Language Therapy sessions. Please read the statements below and circle the number that best matches your view where 1 = strongly agree working towards 7 = strongly disagree.

a. It will be difficult to hear the Speech & Language Therapist in the Skype sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

b. I will need assistance to use the Skype system.

strongly agree — strongly disagree

1 2 3 4 5 6 7

c. I will be able to see the Speech & Language Therapist on the screen clearly.

strongly agree — strongly disagree

1 2 3 4 5 6 7

d. I anticipate that I will be happy to continue with Speech & Language Therapy sessions via Skype.

strongly agree — strongly disagree

1 2 3 4 5 6 7

If you have any comments or other observations about how you think it will be to use Skype for the Speech and Language Therapy sessions then please add them here:

7. The statements in this section are focused on how you anticipate interaction between your child and the therapist and also yourself and the therapist will be in the Skype Speech and Language Therapy sessions. Just as with statements in the previous section circle the number that best matches your agreement with the statement.

a. It will take longer to discuss my child's progress with the Speech & Language Therapist on Skype.

strongly agree — strongly disagree

1 2 3 4 5 6 7

b. I shall be able to talk to the Speech & Language Therapist with ease in the Skype sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

c. My child will be able to follow the therapist's instructions just the same as when face-to-face.

strongly agree 1 2 3 4 5 6 7 strongly disagree

d. My child will be less able to concentrate in the Skype sessions than the face-to-face sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

e. The therapist will be able to respond to my child's communication attempts just the same as when working face-to-face.

strongly agree 1 2 3 4 5 6 7 strongly disagree

f. My child will be less able to interact with the therapist in the Skype sessions than in the face-to-face sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

g. I anticipate that I will be satisfied with the interaction between my child and the Speech & Language Therapist when working through Skype.

strongly agree 1 2 3 4 5 6 7 strongly disagree

If you have any comments or other observations about how interaction will be the same or different in the Skype Speech and Language Therapy sessions then please add them here:

8. The next selection of questions investigates your views on the actual sessions and service provided through Skype. As before please circle the number that best matches your view.

a. My child will be able to access a Speech and Language Therapy service using Skype which otherwise would not be possible.

strongly agree 1 2 3 4 5 6 7 strongly disagree

b. The Skype Speech and Language Therapy sessions will fit in just as well with my child's schedule as the face-to-face sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

c. I will get the same attention from the Speech & Language Therapist in the Skype sessions as face-to-face.

strongly agree 1 2 3 4 5 6 7 strongly disagree

d. I will be able to make contact with the Speech & Language Therapist more readily through Skype and email.

strongly agree 1 2 3 4 5 6 7 strongly disagree

e. I will be more involved in the Skype sessions than the face-to-face Speech and Language Therapy sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

f. I think that the Skype Speech and Language Therapy sessions will be consistently the same standard as each other.

strongly agree 1 2 3 4 5 6 7 strongly disagree

g. Skype Speech and Language Therapy sessions will enable my child to develop their speech & language skills.

strongly agree 1 2 3 4 5 6 7 strongly disagree

h. My child's progress with Skype Speech and Language Therapy sessions will be the same as in face-to-face sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

i. The activities in the Skype Speech and Language Therapy sessions will be as enjoyable as in the face-to-face sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

j. I think that using Skype will be an acceptable way to have Speech & Language Therapy sessions.

strongly agree 1 2 3 4 5 6 7 strongly disagree

If you have any comments or other observations about how the Speech and Language Therapy service will be provided using Skype then please list them here.

9. And finally……

You may anticipate benefits and drawbacks to the Speech and Language Therapy sessions provided using Skype and I should be grateful if you could list those below:

If you have any other comments or other observations about the Skype and face-to-face Speech & Language Therapy sessions then please add them here.

Your support to complete this questionnaire is very much valued.
Please return your questionnaire to Rebecca Matthews
in the stamped addressed envelope provided.

Appendix 14: Main Study Post Trial Questionnaire

Participant Number:

It is much appreciated if you could complete this questionnaire, which should not take longer than 20 minutes to complete. Your additional views are much appreciated and if you wish to expand any of your answers then please use the reverse side of the questionnaire. If there is any difficulty in completing the questionnaire then please contact Rebecca Matthews on 0118 9700300.

1. Have any of the following affected the Skype sessions?
(Please tick all the boxes that apply)

Computer availability	☐
No connection	☐
Echo	☐
Fuzzy picture	☐
Picture freezing	☐
None	☐
Other (please specify)	☐

2. Has it been as easy for the child to respond to the therapist in the Skype sessions as the face-to-face sessions? (Please circle your response)

Yes No

3. Are the materials presented in the Skype sessions as engaging as those presented in the face-to-face sessions? (Please circle your response)

Yes No

4. Can you identify any advantages to Skype Speech and Language Therapy sessions?
(please tick all the boxes that apply)

Child participates more	☐
More convenient timing	☐
More time to talk with therapist	☐
Fewer distractions	☐
Child's attention span	☐
Greater adult participation	☐
Other (please specify)	☐

5. Do you consider any of the following to be a disadvantage to the Skype Speech and Language Therapy sessions? (please tick all the boxes that apply)

Hard to engage with the therapist	☐
Accessing a computer	☐
Speaking to therapist not easy	☐
Difficult to organise space to work in	☐
Keeping child focussed	☐
Materials & equipment less engaging	☐
Other (Please specify)	☐

6. The following questions are focused on how you think the technology has made the Skype Speech & Language Therapy sessions the same or different from face-to-face Speech & Language Therapy sessions. Please read the statements below and circle the number that best matches your view where 1 = strongly agree working towards 7 = strongly disagree.

a. It has been difficult to hear the Speech & Language Therapist in the Skype sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

b. I have needed assistance to use the Skype system.

strongly agree — strongly disagree

1 2 3 4 5 6 7

c. I have been able to see the Speech & Language Therapist on the screen clearly.

strongly agree — strongly disagree

1 2 3 4 5 6 7

d. I will be happy to continue with Speech & Language Therapy sessions via Skype.

strongly agree — strongly disagree

1 2 3 4 5 6 7

If you have any comments or other observations about how you think it has been to use Skype for the Speech and Language Therapy sessions then please add them here:

7. The statements in this section are focused on how you have perceived the interaction between your child and the therapist and also yourself and the therapist has been in the Skype Speech and Language Therapy sessions. Just as with statements in the previous section circle the number that best matches your agreement with the statement.

strongly agree — strongly disagree

1 2 3 4 5 6 7

a. It has taken longer to discuss my child's progress with the Speech & Language Therapist on Skype.

strongly agree — strongly disagree

1 2 3 4 5 6 7

b. I have been able to talk to the Speech & Language Therapist with ease in the Skype sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

c. My child has been able to follow the therapist's instructions just the same as when face-to-face.

strongly agree — strongly disagree

1 2 3 4 5 6 7

d. My child has been less able to concentrate in the Skype sessions than the face-to-face sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

e. The therapist has been able to respond to my child's communication attempts just the same as when working face-to-face.

strongly agree — strongly disagree

1 2 3 4 5 6 7

f. My child has been less able to interact with the therapist in the Skype sessions than in the face-to-face sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

g. I have been satisfied with the interaction between my child and the Speech & Language Therapist when working through Skype.

strongly agree — strongly disagree

1 2 3 4 5 6 7

If you have any comments or other observations about how interaction will be the same or different in the Skype Speech and Language Therapy sessions then please add them here:

8. The next selection of questions investigates your views on the actual sessions and service provided through Skype. As before please circle the number that best matches your view.

strongly agree — strongly disagree

1 2 3 4 5 6 7

a. My child has been able to access a Speech and Language Therapy service using Skype which otherwise would not have been possible.

strongly agree — strongly disagree

1 2 3 4 5 6 7

b. The Skype Speech and Language Therapy sessions have fitted in just as well with my child's schedule as the face-to-face sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

c. I have been able to get the same attention from the Speech & Language Therapist in the Skype sessions as face-to-face.

strongly agree — strongly disagree

1 2 3 4 5 6 7

d. I have been able to make contact with the Speech & Language Therapist more readily through Skype and email.

strongly agree — strongly disagree

1 2 3 4 5 6 7

e. I have been more involved in the Skype sessions than the face-to-face Speech and Language Therapy sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

f. I think that the Skype Speech and Language Therapy sessions have been consistently the same standard as each other.

strongly agree — strongly disagree

1 2 3 4 5 6 7

g. Skype Speech and Language Therapy sessions have enabled my child to develop their speech & language skills.

strongly agree — strongly disagree

1 2 3 4 5 6 7

h. My child's progress with Skype Speech and Language Therapy sessions has been the same as in face-to-face sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

i. The activities in the Skype Speech and Language Therapy sessions have been as enjoyable as in the face-to-face sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

j. I think that using Skype is an acceptable way to have Speech & Language Therapy sessions.

strongly agree — strongly disagree

1 2 3 4 5 6 7

If you have any comments or other observations about how the Speech and Language Therapy service will be provided using Skype then please list them here:

9. And finally……

During these trial sessions you may have been able to identify benefits and drawbacks to the Speech and Language Therapy sessions provided using Skype and I should be grateful if you would list those below:

If you have any other comments or other observations about the Skype and face-to-face Speech & Language Therapy sessions then please add them here.

Your support to complete this questionnaire is very much valued.
Please return your questionnaire to Rebecca Matthews
in the stamped addressed envelope provided.

Appendix 15: Main Study Child Participant Interview Questions

Question Group 1 = computer competence

i. How much time do you spend on the computer?
ii. Where are you when you are on the computer?
iii. What do you do on the computer – specific games/programmes?
iv. How would you rate yourself using the computer – very good – average - not so good.
v. Have you ever used videoconferencing (Skype) before?
vi. Did you need assistance to work the computer at your end?

Question Group 2 = the technology

i. Have you been able to see the Speech & Language Therapist clearly in the Skype sessions?
ii. Some of the other children have said that the picture could not be improved and others have said that it should – what do you think?
iii. Could anything have been improved about the picture?
iv. Could you see the games and equipment at the therapist's end?
v. Could you hear the Speech & Language Therapist okay?
vi. Some of the children have said that the sound is okay and others have said it was hard to hear me – what do you think?
vii. Could the sound be better?

Question Group 3 = interaction with the therapist

i. Some of the children have said that they weren't able to follow my instructions in the Skype sessions and others have said that they could – what do you think?
ii. Were you able to say what you wanted to say to the therapist?
iii. Have you been able to talk to the therapist easily?
iv. Has the therapist been able to respond to you correctly?
v. Some of the other children have said that the Skype sessions were very different to the face-to-face sessions and others have said they were the same – what do you think?

Question Group 4 = session activities

i. Did you like doing the activities in the Skype sessions?
ii. Were there any that you particularly liked?
iii. Any activities that you did not like? Why?
iv. Some of the other children have said that the activities were too hard to do in the Skype sessions – what do you think?
v. Were any activities better in the face-to-face sessions?
vi. Why do you think those activities were better in the face-to-face sessions ?
vii. Were any activities better in the Skype sessions? Why do you think that was?

Question Group 5 = Skype Speech and Language Therapy Service/Acceptance

i. All the children liked the Skype sessions – do you agree?

ii. Are the Skype sessions the same as the face-to-face sessions?
iii. Was it easy to fit the Skype sessions into your timetable?
Did you miss out on other things because of the Skype?
Did the Skype sessions mean that you could do other things?
Did it mean missing more lessons?
iv. Do you prefer Skype or the face-to-face sessions?
or do you like them both equally? Why?
v. Can you think of any good reasons to have Speech and Language Therapy on Skype?
Can you think of any good reasons to have Speech and Language Therapy face-to-face?
vi. Can you think of any reasons not to have Speech and Language Therapy on Skype?
Can you think of any reasons not to have Speech and Language Therapy face-to-face?
vii. Would you like to stop the Skype sessions?

Question 6 = Any other thoughts

Do you have any thoughts that you would like to share
that we haven't thought of in our chat?

Appendix 16: Original Discourse Coding - after Pennington and McConachie (1999)

Moves

Initiation	I	introduce a topic & requires a response – can be within a theme
Responses	R	a reply to an initiation (I or R/I or F/I)
Response/Initiations	R/I	a reply that also requires a reply
No Response	NR	no response heard or made with gesture or vocalisation
Follow up	F	a response keeping to the topic but no response requested = acknowledgement
Follow up/Initiation	F/I	a response keeping to topic, a response requested but not a direct question

Functions

Request for joint attention	**RJA**	attract attention to topic
Request for Information	**RI**	seeking knowledge on topic, activities, people etc….
Request for object/action	**ROA**	asking listener to respond with handing over object or doing an activity
Request for clarification		
i. Confirmation	**RCC**	previous message is restated but not exact repetition
ii. Neutral request	**NR**	previous message not understood
iii. Specific request	**RCS**	just part of the message is not understood
Provision of Information	**PI**	comment on situation, people, action etc… as well as response
Provision of Clarification		
i. Revision	**PCrev**	previous message repeated in meaning but not exact wording
ii. Repetition	**PCrep**	previous message repeated exactly
Self or Shared Expression	**SSE**	No extra information added but indicates mood of speaker
Acknowledgement	**ACK**	No extra information added but confirms message heard and understood
Confirmation/Denial	**CD**	statement to agree or disagree
Unintelligible	**UNINTELL**	message not understood by transcriber but interpreted by speakers

Mode

Verbal	*V*	speech – either intelligible or unintelligible
Vocalisation	*VOC*	sounds - not speech - which has a meaning that can be interpreted
Gesture	*GEST*	specific or unspecific that can convey a meaning e.g. pointing/laughing
Alternative Communication	*AAC*	alternative system used – high tech or low tech, including signing and symbol

Appendix 17: Main Study Session Profile Ratings with Cost Data Rating for each Participant

Participant 1JF	1	2	3	4	5	6	7	8	9	10	Total	Average	Combined
Session Date	22/09/09	29/09/09	06/10/09	13/10/09	20/10/09	03/11/09	10/11/09	17/11/09	24/11/09	01/12/09			
F2F	1		1		Recorded		1		1		5		
Skype		1		Recorded				1		1	5		
1. Clinical Activity = goals achieved													
>75% = 3				3	3	3	3	3		3			
50-75% = 2	2	2	2						2				
25-50% = 1													
<25% = 0													
F2F Score out of 3	2		2		3		3		2		12	2.40	2.40
Skype Score out of 3		2		3		3		3		3	14	2.80	2.80
2. Technology													
Visual Clarity Rating													
Child - No Difficulty = 2	2	2	2	2	2	2	2	2	2				
Some Difficulty = 1										1			
Problems = 0													
Adult Rating > 8/10 = 2	2		2		2	2	2		2				
5/10 - 8/10 = 1		1		1				1		1			
<5/10 = 0													
Auditory Clarity Rating													
Child - No difficulty = 2	2	2	2		2	2	2	2	2				
Some Difficulty = 1				1						1			
Problems = 0													
Adult Rating > 8/10 = 2	2		2		2	2	2		2				

5/10 - 8/10 = 1		1		1				1		1			
<5/10 = 0													
No interruptions = 2	2		2			2	2	2	2				
<3 = 1				1	1					1			
3 or more = 0		0											
F2F Score out of 10	10		10		9		10		10		49	10.37	10.37
Skype Score out of 10		6		6		10		8		5	35	7.00	7.00
3. Participation													
Child able to speak = 2	2	2	2	2	2	2	2	2	2	2			
Unable to speak = 1													
Child relaxed = 2	2	2	2	2	2	2	2	2	2	2			
Anxious = 1													
F2F Score out of 4	4		4		4		4		4		20	4.00	4.00
Skype Score out of 4		4		4		4		4		4	20	4.00	4.00
4. Costs to provide Speech and Language Therapy													
Liaison	0	0	8	0	2	0	0	0	10	0			
session plan admin	21	20	18	26	8	24	10	25	9	21			
Prep/Clear up	12	12	15	18	15	9	12	12	12	12			
Travelling	20	0	32	0	69	0	50	0	34	0			
Therapy time	56	60	69	72	59	69	69	58	59	80			
Total Time	109	92	142	116	153	102	141	95	124	113			
F2F @ £1 per minute	£109.00		£142.00		£153.00		£141.00		£124.00				
Skype @ £1 per minute		£92.00		£116.00		£102.00		£95.00		£113.00			
Mileage	15	0	16	0	16	0	35	0	17	0			
Mileage Cost @	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense	£6.30	£0.00	£6.72	£0.00	£6.72	£0.00	£14.70	£0.00	£7.14	£0.00			

F2F Total Costs	£115.30		£148.72		£159.72		£155.70		£131.14		711		
Skype Total Costs		£92.00		£116.00		£102.00		£95.00		£113.00	518		
F2F Therapy Time	56		69		59		69		59		312		
Skype Therapy Time		60		72		69		58		80	339		
F2F Costs per minute	£2.06		£2.16		£2.71		£2.26		£2.22			£2.28	2.00
Skype Costs per minute		£1.53		£1.61		£1.48		£1.64		£1.41		£1.53	3.00
Rating Total for F2F sessions out of a max of 20													18.77
Rating Total for Skype Sessions													16.80

Participant 2JM	1	2	3	4	5	6	7	8	9	10	Total	Average	Combined
Session Date	16/09/09	23/9/09	30/9/09	7/10/09	19/10/09	23/0/09	4/11/09	11/11/09	18/11/09	25/11/09			
F2F		1				Recorded				1	3		
Skype	1		1	1	Recorded		1	1	1		7		
1. Clinical Activity = goals achieved													
>75% = 3	3	3	3	3			3	3	3				
50-75% = 2					2	2				2			
25-50% = 1													
<25% = 0													
F2F Score out of 3		3				2				2	7	2.33	2.33
Skype Score	3		3	3	2		3	3	3		20	2.86	2.86
2. Technology													
Visual Clarity Rating													
Child - No Difficulty = 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty = 1													
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2	2	2	2	2	2	2	2			
5/10 - 8/10 = 1													
<5/10 = 0													
Auditory Clarity Rating													
Child - No Difficulty = 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty = 1													
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2	2	2	2	2	2	2				
5/10 - 8/10 = 1													
<5/10 = 0													

No interruptions = 2		2			2		2	2	2	2			
<3 = 1						1							
3 or more = 0	0		0	0									
F2F Score out of 10		10				9				8	27	9	9.00
Skype Score out of 10	8		8	8	10		10	10	10		64	9.14	9.14
3. Participation													
Child able to speak = 2	2	2	2	2	2	2	2	2	2	2			
unable to speak = 1													
Child relaxed = 2		2	2		2	2	2	2	2	2			
anxious = 1	1			1									
F2F Score out of 4		4				4				4	12	4.00	4.00
Skype Score out of 4	3		4	3	4		4	4	4		26	3.71	3.71
4. Costs to provide Speech and Language Therapy													
Liaison	5	38	0	0	5	7	0	0	2	27			
session plan admin	20	6	35	36	30	13	19	28	35	10			
Prep/Clear up	18	27	19	10	15	13	10	6	5	12			
Travelling	0	83	0	0	0	70	0	0	0	109			
Therapy Time	65	53	60	60	64	60	70	59	60	65			
Total Time	108	207	114	106	114	163	99	93	102	223			
F2F @ £1 per minute		£207.00				£163.00				£223.00			
Skype @ £1 per minute	£108.00		£114.00	£106.00	£114.00		£99.00	£93.00	£102.00				
Mileage	0	45	0	0	0	42	0	0	0	45			
Mileage Cost @	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense	£0.00	£18.90	£0.00	£0.00	£0.00	£17.64	£0.00	£0.00	£0.00	£18.90			
F2F Total Costs		£225.90				£180.64				£241.90	£648.44		
Skype Total Costs	£108.00		£114.00	£106.00	£114.00		£99.00	£93.00	£102.00		£736.00		

F2F Therapy Time		53				60				65	178		
Skype Therapy Time	65		60	60	64		70	59	60		438		
F2F Costs per minute		£4.25				£3.01				£3.72		£3.64	1.00
Skype Costs per minute	£1.66		£1.90	£1.77	£1.78		£1.41	£1.58	£1.70			£1.68	3.00
Rating Total for F2F Sessions out of a max of 20													16.33
Rating Total for Skype Sessions													18.71

Participant 3JM		1	2	3	4	5	6	7	8	9	10	Total	Average	Combined
Session Date		2/11/09	16/11/09	30/11/09	14/12/09	18/1/10	1/2/10	22/2/10	22/3/10	19/4/10	10/5/10			
F2F		1	1				1		Recorded		1	5		
Skype				1	1	1		1		Recorded		5		
1.Clinical Activity = goals achieved														
>75%	= 3	3	3		3					3				
50-75%	= 2			2		2		2						
25-50%	= 1						1		1		1			
<25%	= 0													
F2F Score out of 3		3	3				1		1		1	9	1.80	1.80
Skype Score out of 3				2	3	2		2		3		12	2.40	2.40
2. Technology														
Visual Clarity Rating														
Child - No Difficulty	= 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty	= 1													
Problems	= 0													
Adult rating > 8/10	= 2	2	2	2		2	2	2	2	2	2			
5/10 - 8/10	= 1				1									
<5/10	= 0													
Auditory Clarity Rating														
Child = No difficulty	= 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty	= 1													
Problems	= 0													
Adult view> 8/10	= 2	2	2	2	2	2	2	2	2	2	2			
5/10 - 8/10	= 1													
<5/10	= 0													

<3 = 1				1				1					
3 or more = 0					0		0		0				
F2F Score out of 10	10	10				10		9		10	49	9.80	9.80
Skype Score out of 10			10	8	8		8		8		42	8.40	8.40
3. Participation													
Child able to speak = 2	2	2	2	2	2	2	2	2	2	2			
unable to speak = 1													
Child relaxed = 2	2	2	2	2	2		2	2	2	2			
anxious = 1						1							
F2F Score out of 4	4	4				3		4		4	19	3.80	3.80
Skype Score out of 4			4	4	4		4		4		20	4.00	4.00
4. Costs to provide Speech and Language Therapy													
Liaison	25	10	3	2	3	6	2	43	7	5			
session plan admin	7	6	23	20	17	13	19	11	20	6			
Prep/Clear up	12	11	15	14	4	20	11	13	15	17			
Travelling	71	60	0	0	0	65	0	38	0	75			
Therapy Time	58	58	65	58	61	56	60	60	60	60			
Total Time	173	145	106	94	85	160	92	165	102	163			
F2F Cost @ £1 per minute	£173.00	£145.00				£160.00		£165.00		£163.00			
Skype Cost @ £1 per minute			£106.00	£94.00	£85.00		£92.00		£102.00				
Mileage	42	33	0	0	0	12.5	0	18	0	41			
Mileage Cost @	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense	£17.64	£13.86	£0.00	£0.00	£0.00	£5.25	£0.00	£7.56	£0.00	£17.22			
F2F Total Costs	£190.64	£158.86				£165.25		£172.56		£180.22	£867.53		
Skype Total Costs			£106.00	£94.00	£85.00		£92.00		£102.00		£479.00		
F2F Therapy Time	58	58				56		60		60	292		

Skype Therapy Time			65	58	61		60		60		304		
F2F Costs per minute	£3.29	£2.74				£2.95		£2.88		£3.00		£2.97	2.00
Skype Costs per minute			£1.63	£1.62	£1.39		£1.53		£1.70			£1.57	3.00
Rating Total for F2F Sessions out of a max of 20													17.40
Rating Total for Skype Sessions													17.80

Participant 4SM		1	2	3	4	5	6	7	8	9	10	Total	Average	Combined
Session Date		14/9/09	13/10/09	10/11/09	8/12/09	12/1/10	16/3/10	20/4/10	24/5/10	28/6/10	28/7/10			
F2F								Recorded			1	2		
Skype		1	1	1	1	1	Recorded		1	1		8		
1. Clinical Activity														
>75% Goals achieved	= 3		3	3	3	3	3	3	3	3				
50-75%	= 2	2												
25-50%	= 1										1			
<25%	= 0													
F2F Score out of 3								3			1	4	2.00	2.00
Skype Score out of 3		2	3	3	3	3	3		3	3		23	2.88	2.88
2. Technology														
Visual Clarity Rating														
Child Rating No Difficulty	= 2				2		2	2	2	2	2			
Some Difficulty	= 1	1	1	1		1								
Problems	= 0													
Adult Rating > 8/10	= 2	2	2	2	2	2	2	2	2		2			
5/10 - 8/10	= 1													
<5/10	= 0									0				
Auditory Clarity Rating														
Child No difficulty	= 2				2		2	2	2	2	2			
Some Difficulty	= 1	1	1	1		1								
Problems	= 0													
Adult > 8/10	= 2	2	2	2		2	2	2	2	2	2			
5/10 - 8/10	= 1				1									
<5/10	= 0													

No interruptions	= 2			2	2			2	2		2			
<3	= 1	1				1	1			1				
3 or more	= 0		0											
F2F Score out of 10								10			10	20	10.00	10.00
Skype Score out of 10		7	6	8	9	7	9		10	7		80	10	10.00
3. Participation														
Child able to speak	= 2	2	2	2	2	2	2	2	2	2	2			
unable to speak	= 1													
Child relaxed	= 2	2	2	2	2	2	2	2	2	2	2			
anxious	= 1													
F2F Score out of 4								4			4	8	4.00	4.00
Skype Score out of 4		4	4	4	4	4	4		4	4		32	4.00	4.00
4. Costs to provide Speech and Language Therapy														
Liaison		5	20	2	5	9	4	35	5	5	35			
session plan admin		25	15	24	34	25	31	13	20	18	15			
Prep/Clear up		21	12	11	16	12	20	20	14	10	32			
Travelling		0	0	0	0	0	0	70	0	0	60			
Therapy Time		70	60	70	60	67	55	60	60	56	80			
Total Time		121	107	107	115	113	110	198	99	89	222			
F2F Cost @ £1 per minute								£198.00			£222.00			
Skype Cost @ £1 per minute		£121.00	£107.00	£107.00	£115.00	£113.00	£110.00		£99.00	£99.00				
Mileage		0	0	0	0	0	0	42	0	0	40			
Mileage Cost @		£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense		£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£17.64	£0.00	£0.00	£16.80			
F2F Total Costs								£215.64			£238.80	454.44		
SkypeTotal Costs		£121.00	£107.00	£107.00	£115.00	£113.00	£110.00		£99.00	£99.00		871.00		

F2F Therapy Time							60			80	140.00		
Skype Therapy Time	70	60	70	60	67	55		60	56		498.00		
F2F Costs per minute							£3.59			£2.99		£3.25	1.00
Skype Costs per minute	£1.73	£1.78	£1.53	£1.92	£1.69	£2.00		£1.65	£1.59			£1.75	3.00
Rating Total for F2F Sessions out of a max of 20													17.00
Rating Total for Skype Sessions													19.88

Participant 5SM		1	2	3	4	5	6	7	8	9	10	Total	Average	Combine
Session Date		23/10/09	6/11/09	13/11/09	20/11/09	27/11/09	4/12/09	11/12/09	18/12/09	8/1/10	5/2/10			
F2F		1		1		1		Recorded			1	5		
Skype			1		1		1		Recorded	1		5		
1. Clinical Activity														
>75%	= 3		3				3	3						
50-75%	= 2	2		2	2	2			2	2	2			
25-50%	= 1													
<25%	= 0													
F2F Score out of 3		2		2		2		3			2	11	2.20	2.20
Skype Score out of 3			3		2		3		2	2		12	2.40	2.40
2. Technology														
Visual Clarity Rating														
Child Rating No Difficulty	= 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty	= 1													
Problems	= 0													
Adult Rating > 8/10	= 2	2	2	2	2	2	2	2		2	2			
5/10 - 8/10	= 1								1					
<5/10	= 0													
Auditory Clarity Rating														
Child Rating No difficulty	= 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty	= 1													
Problems	= 0													
Adult Rating > 8/10	= 2	2	2	2	2	2	2	2		2	2			
5/10 - 8/10	= 1								1					
<5/10	= 0													

No interruptions	= 2		2	2	2				2	2	2			
<3	= 1	1				1	1	1						
3 or more	= 0													
F2F Score out of 10		9		10		9		9			10	46	9.20	9.20
Skype Score out of 10			10		10		9		8	10		47	9.40	9.40
3. Participation														
able to speak	= 2	2	2	2	2	2	2	2	2	2	2			
unable to speak	= 1													
relaxed	= 2		2	2		2	2		2	2	2			
anxious	= 1	1			1			1						
F2F Score out of 4		3		4		4		3			4	18	3.60	3.60
Skype Score out of 4			4		3		4		4	4		19	3.80	3.80
4. Costs to provide Speech and Language Therapy														
Liaison		5	0	0	0	4	0	13	3	13	5			
session plan admin		10	15	12	27	8	33	7	22	26	8			
Prep/Clear up		14	20	30	11	21	19	35	10	6	17			
Travelling		67	0	68	0	67	0	73	0	0	65			
Therapy Time		70	50	63	52	65	61	68	57	65	60			
Total Time		166	85	173	90	165	113	196	92	110	155			
F2F Cost @ £1 per minute		£166.00		£173.00		£165.00		£196.00			£155.00			
Skype Cost @ £1 per minute			£85.00		£90.00		£113.00		£92.00	£110.00				
Mileage		34	0	34	0	34	0	35	0		46			
Mileage Cost @		£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense		£14.28	£0.00	£14.28	£0.00	£14.28	£0.00	£14.70	£0.00	£0.00	£19.32			
F2F Total Costs		£180.28		£187.28		£179.28		£210.70			£174.32	931.86		
Skype Total Costs			£85.00		£90.00		£113.00		£92.00	£110.00		490.00		

F2F Therapy Time	70		63		65		68			60	326.00		
Skype Therapy Time		50		52		61		57	65		285.00		
F2F Costs per minute	£2.58		£2.97		£2.76		£3.10			£2.91		£2.86	2.00
Skype Costs per minute		£1.70		£1.73		£1.85		£1.61	£1.69			£1.72	3.00
Rating Total for F2F Session out of a max of 20													17.00
Rating Total for Skype Sessions													18.60

Participant 6JF		1	2	3	4	5	6	7	8	9	10	Total	Average	Combine
Session Date		16/12/10	13/1/10	11/2/10	02/24/10	3/3/10	9/3/10	17/3/10	31/3/10	28/4/10	4/5/10			
F2F							Recorded				1	2		
Skype		1	1	1	1	1		Recorded	1	1		8		
1. Clinical Activity														
>75% goals achieved	= 3			3				3	3	3				
50-75%	= 2	2	2		2	2	2				2			
25-50%	=1													
<25%	= 0													
F2F Score out of 3							2				2	4	2.00	2.00
Skype Score out of 3		2	2	3	2	2		3	3	3		20	2.50	2.50
2. Technology														
Visual Clarity Rating														
Child Rating No Difficulty	= 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty	= 1													
Problems	= 0													
Adult Rating > 8/10	= 2	2	2	2	2	2	2	2	2	2	2			
5/10 - 8/10	= 1													
<5/10	= 0													
Auditory Clarity Rating														
Child Rating No difficulty	= 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty	= 1													
Problems	= 0													
Adult Rating > 8/10	= 2	2	2	2	2	2	2	2	2	2	2			
5/10 - 8/10	= 1													
<5/10	= 0													

No interruptions	= 2	2	2	2	2	2	2	2	2	2	2			
<3	= 1													
3 or more	= 0													
F2F Score out of 10							10				10	20	10.00	10.00
Skype Score out of 10		10	10	10	10	10		10	10	10		80	10.00	10.00
3. Participation														
Child able to speak	= 2	2	2	2	2	2	2	2	2	2	2			
unable to speak	= 1													
Child relaxed	= 2		2	2	2	2	2		2	2	2			
anxious	= 1	1						1						
F2F Score out of 4							4				4	8	4.00	4.00
Skype Score out of 4		3	4	4	4	4		3	4	4		27	3.38	3.38
4. Costs to provide Speech and Language Therapy														
Liaison		2	9	2	5	6	63	8	2	2	19			
session plan admin		20	24	27	12	15	10	15	16	22	6			
Prep/Clear up		14	11	3	8	9	15	14	10	12	21			
Travelling		0	0	0	0	0	29	0	0	0	44			
Therapy Time		39	35	43	30	40	30	38	40	37	34			
Total Time		75	79	75	55	70	147	75	68	73	124			
F2F Cost @ £1 per minute							£147.00				£124.00			
Skype Cost @ £1 per minute		£75.00	£79.00	£75.00	£55.00	£70.00		£75.00	£68.00	£73.00				
Mileage		0	0	0	0	0	14	0	0	0	18			
Mileage Cost @		£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense		£0.00	£0.00	£0.00	£0.00	£0.00	£5.88	£0.00	£0.00	£0.00	£7.56			
F2F Total Costs							£152.88				£131.56	284.44		
Skype Total Costs		£75.00	£79.00	£75.00	£55.00	£70.00		£75.00	£68.00	£73.00		570		

F2F Therapy Time						30				34	64		
Skype Therapy Time	39	35	43	30	40		38	40	37		302		
F2F Costs per minute						£5.10				£3.86		£4.44	0.00
Skype Costs per minute	£1.92	£2.26	£1.74	£1.83	£1.75		£1.97	£1.70	£1.97			£1.89	3.00
Rating Total for F2F Sessions out of a max of 20													18.00
Rating Total for Skype Sessions													18.88

Participant 7JM	1	2	3	4	5	6	7	8	9	10	Total	Average	Combine
Session Date	3/11/09	12/11/09	17/11/09	26/11/09	1/12/09	10/12/09	17/12/09	23/2/10	4/3/10	10/3/10			
F2F	1		1		Recorded			1			4		
Skype		1		1		Recorded	1		1	1	6		
1. Clinical Activity													
>75% = 3			3										
50-75% = 2	2	2		2	2	2	2	2	2	2			
25-50% = 1													
<25% = 0													
F2F Score out of 3	2		3		2			2			9	2.25	2.25
Skype Score out of 3		2		2		2	2		2	2	12	2.00	2.00
2. Technology													
Visual Clarity Rating													
Child Rating No Difficulty = 2	2		2		2	2	2	2		2			
Some Difficulty = 1		1		1					1				
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2	2	2	2		2	2	2			
5/10 - 8/10 = 1							1						
<5/10 = 0													
Auditory Clarity Rating													
Child Rating No difficulty = 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty = 1													
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2	2	2	2		2	2	2			
5/10 - 8/10 = 1							1						
<5/10 = 0													

No interruptions	= 2	2	2	2	2	2	2	2	2		2			
<3	= 1									1				
3 or more	= 0													
F2F Score out of 10		10		10		10			10			40	10.00	10.00
Skype Score out of 10			9		9		10	8		8	10	54	9.00	9.00
3. Participation														
Child able to speak	= 2	2	2	2	2	2	2	2	2	2	2			
unable to speak	= 1													
Child relaxed	= 2	2	2	2	2	2	2	2	2	2	2			
anxious	= 1													
F2F Score out of 4		4		4		4			4			16	4.00	4.00
Skype Score out of 4			4		4		4	4		4	4	24	4.00	4.00
4. Costs to provide Speech and Language Therapy														
Liaison		4	5	3	2	0	0	4	6	2	5			
session plan admin		8	16	8	23	9	13	17	8	11	11			
Prep/Clear up		15	19	18	5	17	8	15	19	7	14			
Travelling		24	0	29	0	41	0	0	28	0	0			
Therapy Time		30	30	26	40	31	40	41	26	38	42			
Total Time		81	70	84	70	98	61	77	87	58	72			
F2F Cost @ £1 per minute		£81.00		£84.00		£98.00			£87.00					
Skype Cost @ £1 per minute			£70.00		£70.00		£61.00	£77.00		£58.00	£72.00			
Mileage		17	0	14	0	19	0	0	14	0	0			
Mileage Cost @		£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense		£7.14	£0.00	£5.88	£0.00	£7.98	£0.00	£0.00	£5.88	£0.00	£0.00			
F2F Total Costs		£88.14		£89.88		£105.98			£92.88			376.88		
Skype Total Costs			£70.00		£70.00		£61.00	£77.00		£58.00	£72.00	408.00		

F2F Therapy Time	30		26		31			26			113.00		
Skype Therapy Time		30		40		40	41		38	42	231.00		
F2F Costs per minute	£2.94		£3.57		£3.42			£3.57				£3.34	1.00
Skype Costs per minute		£2.33		£1.75		£1.53	£1.88		£1.53	£1.71		£1.77	3.00
Rating Total for F2F Sessions out of a max of 20													17.25
Rating Total for Skype Sessions													18.00

Participant 8SM	1	2	3	4	5	6	7	8	9	10	Total	Average	Combine
Session Date	9/11/09	16/11/09	23/11/09	7/12/09	14/12/09	11/1/10	18/1/10	1/2/10	8/2/10	22/2/10			
F2F								Recorded			1		
Skype	1	1	1	1	1	1	1		1	Recorded	9		
1. Clinical Activity													
>75% goals achieved = 3				3									
50-75% = 2	2	2	2		2	2	2		2	2			
25-50% = 1								1					
<25% = 0													
F2F Score out of 3								1			1	1.00	1.00
Skype Score out of 3	2	2	2	3	2	2	2		2	2	19	2.11	2.11
2. Technology													
Visual Clarity Rating													
Child Rating No Difficulty = 2		2		2	2	2	2	2	2	2			
Some Difficulty = 1	1		1										
Problems = 0													
Adult Rating > 8/10 = 2	2	2		2	2	2		2		2			
5/10 - 8/10 = 1			1				1		1				
<5/10 = 0													
Auditory Clarity Rating													
Child Rating No difficulty = 2		2			2	2		2	2	2			
Some Difficulty = 1	1		1	1			1						
Problems = 0													
Adult Rating > 8/10 = 2	2		2			2		2		2			
5/10 - 8/10 = 1		1		1	1		1		1				
<5/10 = 0													

No interruptions	= 2	2	2		2	2	2	2	2	2	2			
<3	= 1			1										
3 or more	= 0													
F2F Score out of 10									10			10	10.00	10.00
Skype Score out of 10		8	9	6	8	9	10	7		8	10	75	8.33	8.33
3. Participation														
Child able to speak	= 2	2	2	2	2	2	2	2	2	2	2			
unable to speak	= 1													
Child relaxed	= 2	2	2	2	2	2	2	2	2	2	2			
anxious	= 1													
F2F Score out of 4									4			4	4.00	4.00
Skype Score out of 4		4	4	4	4	4	4	4		4	4	4	4.00	4.00
4. Costs to provide Speech and Language Therapy														
Liaison		7	10	5	3	4	10	10	35	20	9			
Session plan admin		22	21	46	19	18	21	19	10	18	13			
Prep/Clear up		10	11	3	9	16	10	6	20	6	8			
Travelling		0	0	0	0	0	0	0	65	0	0			
Therapy Time		35	32	40	40	35	35	35	40	30	30			
Total Time		74	74	94	71	73	76	70	170	74	60			
F2F Cost @ £1 per minute									£170.00					
Skype Cost @ £1 per minute		£74.00	£74.00	£94.00	£71.00	£73.00	£76.00	£70.00		£74.00	£60.00			
Mileage		0	0	0	0	0	0	0	12.5	0	0			
Mileage Cost @		£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense		£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£5.25	£0.00	£0.00			
F2F Total Costs									£175.25			175.25		
Skype Total Costs		£74.00	£74.00	£94.00	£71.00	£73.00	£76.00	£70.00		£74.00	£60.00	666.00		

F2F Therapy Time								40			40.00		
SKYPE Therapy Time	35	32	40	40	35	35	35		30	30	312.00		
F2F Costs per minute								£4.38				£4.38	0.00
Skype Costs per minute	£2.11	£2.31	£2.35	£1.78	£2.09	£2.17	£2.00		£2.47	£2.00		£2.13	2.00
Rating Total for F2F Sessions out of a max of 20													15.00
Rating Total for Skype Sessions													16.44

Participant 9IM	1	2	3	4	5	6	7	8	9	10	Total	Average	Combine
Session Date	4/12/09	12/2/10	23/3/10	30/3/10	29/4/10	13/5/10	8/6/10	29/6/10	13/7/10	20/7/10			
F2F	1	1					Recorded				3		
Skype			1	1	1	1		Recorded	1	1	7		
1. Clinical Activity													
>75% goals achieved = 3						3	3	3		3			
50-75% = 2			2	2	2				2				
25-50% = 1	1	1											
<25% = 0													
F2F Score out of 3	1	1					3				5	1.66	1.66
Skype Score out of 3			2	2	2	3		3	2	3	17	2.42	2.42
2. Technology													
Visual Clarity Rating													
Child Rating No Difficulty = 2	2	2	2	2	2	2	2	2		2			
Some Difficulty = 1									1				
Problems = 0													
Adult Rating > 8/10 = 2	2	2					2						
5/10 - 8/10 = 1			1			1			1	1			
<5/10 = 0				0	0			0					
Auditory Clarity Rating													
Child Rating No difficulty = 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty = 1													
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2				2		2	2			
5/10 - 8/10 = 1				1	1	1		1					
<5/10 = 0													

No interruptions	= 2					2	2	2		2	2			
<3	= 1			1	1				1					
3 or more	= 0	0	0											
F2F Score out of 10		8	8					10				26	8.67	8.67
Skype Score out of 10				8	6	7	8		6	8	9	52	7.43	7.43
3. Participation														
Child able to speak	= 2	2	2	2	2	2	2	2	2	2	2			
unable to speak	= 1													
Child relaxed	= 2			2	2	2	2		2	2	2			
anxious	= 1	1	1					1						
F2F score out of 4		3	3					3				9	3.00	3.00
Skype Score out of 4				4	4	4	4		4	4	4	28	4.00	4.00
4. Costs to provide Speech and Language Therapy														
session plan admin		15	10	12	14	13	25	23	23	14	13			
Prep/Clear up		10	15	18	19	15	16	11	14	5	15			
Travelling		26	35	0	0	0	0	29	0	0	0			
Therapy Time		30	30	20	20	23	30	30	31	30	31			
Total Time		81	90	50	53	51	71	93	68	49	59			
F2F Cost @ £1 per minute		£83.00	£90.00					£98.00						
Skype Cost @ £1 per minute				£62.00	£65.00	£55.00	£81.00		£79.00	£70.00	£66.00			
Mileage		13	19	0	0	0	0	16	0	0	0			
Mileage Cost @		£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense		£5.46	£7.98	£0.00	£0.00	£0.00	£0.00	£6.72	£0.00	£0.00	£0.00			
F2F Total Costs		£88.46	£97.98					£104.72				291.16		
Skype Total Costs				£62.00	£65.00	£55.00	£81.00		£79.00	£70.00	£66.00	478		
F2F Therapy Time		30	30					30				90		

Skype Therapy Time			20	20	23	30		31	30	31	185		
F2F Costs per minute	£2.95	£3.27					£3.49					£3.24	1.00
Skype Costs per minute			£3.10	£3.25	£2.39	£2.70		£2.55	£2.33	£2.13		£2.58	2.00
Rating Total for F2F Sessions out of a max of 20													14.34
Rating Total for Skype Sessions													14.85

Participant 10JF	1	2	3	4	5	6	7	8	9	2	Total	Average	Combine
Session Date	6/3/10	20/3/10	27/3/10	2/4/10	8/5/10	15/5/10	29/5/10	5/6/10	20/6/10	4/7/10			
F2F					1			Recorded			2		
Skype	1	1	1	1		1	1		Recorded	1	8		
1. Clinical Activity													
>75% goals achieved = 3	3	3		3		3	3	3		3			
50-75% = 2			2		2				2				
25-50% = 1													
<25% = 0													
F2F Score out of 3					2			3			5	2.50	2.50
Skype Score out of 3	3	3	2	3		3	3		2	3	22	2.75	2.75
2. Technology													
Visual Clarity Rating													
Child Rating No Difficulty = 2		2	2		2	2	2	2	2	2			
Some Difficulty = 1	1			1									
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2	2	2	2	2	2	2	2			
5/10 - 8/10 = 1													
<5/10 = 0													
Auditory Clarity Rating													
Child Rating No difficulty = 2	2	2		2	2	2	2	2	2	2			
Some Difficulty = 1			1										
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2	2	2	2	2	2	2	2			
5/10 - 8/10 = 1													
<5/10 = 0													

No interruptions	= 2	2	2	2	2	2	2	2		2				
<3	= 1								1		1			
3 or more	= 0													
F2F Score out of 10						10			10			20	10.00	10.00
Skype Score out of 10		9	10	9	9		10	10		10	9	76	9.50	9.50
3. Participation														
Child able to speak	= 2	2	2	2	2	2	2	2	2	2	2			
unable to speak	= 1													
Child relaxed	= 2				2			2		2	2			
anxious	= 1	1	1	1		1	1		1					
F2F Score out of 4						3			3			6	3.00	3.00
Skype Score out of 4		3	3	3	4		3	4		4	4	28	3.50	3.50
4. Costs to provide Speech and Language Therapy														
Liaison		4	4	3	8	8	9	6	14	7	4			
session plan admin		22	19	19	12	14	26	18	15	20	29			
Prep/Clear up		9	15	18	16	6	15	12	21	8	19			
Travelling		0	0	0	0	52	0	0	76	0	0			
Therapy Time		40	42	37	30	35	45	30	43	37	38			
Total Time		75	80	77	66	115	95	66	169	72	90			
F2F Cost @ £1 per minute						£115.00			£169.00					
Skype Cost @ £1 per minute		£75.00	£80.00	£77.00	£66.00		£95.00	£66.00		£72.00	£90.00			
Mileage		0	0	0	0	38	0	0	47	0	0			
Mileage Cost @		£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense		£0.00	£0.00	£0.00	£0.00	£15.96	£0.00	£0.00	£19.74	£0.00	£0.00			
F2F Total Costs						£130.96			£188.74			319.70		
Skype Total Costs		£75.00	£80.00	£77.00	£66.00		£95.00	£66.00		£72.00	£90.00	621.00		

F2F Therapy Time					35			43			78.00		
Skype Therapy Time	40	42	37	30		45	30		37	38	299.00		
F2F Costs per minute					£3.74			£4.39				4.10	0.00
Skype Costs per minute	£1.88	£1.90	£2.08	£2.20		£2.11	£2.20		£1.95	£2.37		2.08	2.00
Rating Total for F2F Sessions out of a max of 20													16.00
Rating Total for Skype Sessions													17.25

Participant 11SF	1	2	3	4	5	6	7	8	9	10	Total	Average	Combined
Session Date	19/5/10	24/5/10	14/6/10	17/6/10	21/6/10	5/7/10	22/9/10	29/9/10	6/10/10	13/10/10			
F2F						Recorded					1		
Skype	1	1	1	1	Recorded		1	1	1	1	9		
1. Clinical Activity													
>75% goals achieved = 3	3	3	3	3	3	3	3	3	3	3			
50-75% = 2													
25-50% = 1													
<25% = 0													
F2F Score out of 3						3					3	3.00	3.00
Skype Score out of 3	3	3	3	3	3		3	3	3	3	27	3.00	3.00
2. Technology													
Visual Clarity Rating													
Child Rating No Difficulty = 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty = 1													
Problems = 0													
Adult Rating > 8/10 = 2			2		2	2	2	2	2	2			
5/10 - 8/10 = 1				1									
<5/10 = 0	0	0											
Auditory Clarity Rating													
Child Rating No difficulty = 2	2	2	2	2	2	2	2	2	2	2			
Some Difficulty = 1													
Problems = 0													
Adult Rating > 8/10 = 2	2	2	2		2	2	2	2	2	2			
5/10 - 8/10 = 1				1									
<5/10 = 0													

No interruptions = 2	2					2	2	2	2	2			
<3 = 1		1											
3 or more = 0			0	0	0								
F2F Score out of 10						10					10	10.00	10.00
Skype Score out of 10	8	7	8	6	8		10	10	10	10	77	8.56	8.56
3. Participation													
Child able to speak = 2	2	2	2	2	2	2	2	2	2	2			
unable to speak = 1													
Child relaxed = 2	2	2	2	2	2	2	2	2	2	2			
anxious = 1													
F2F Score out of 4						4					4	4.00	4.00
Skype Score out of 4	4	4	4	4	4		4	4	4	4	36	4.00	4.00
4. Costs to provide Speech and Language Therapy													
Liaison	8	4	2	5	4	15	20	4	4	6			
session plan admin	24	21	23	24	13	8	15	17	16	17			
Prep/Clear up	9	13	14	10	13	22	11	9	6	7			
Travelling	0	0	0	0	0	53	0	0	0	0			
Therapy Time	30	32	40	39	39	40	37	34	34	34			
Total Time	71	70	79	78	69	138	83	64	60	64			
F2F Cost @ £1 per minute						£138.00							
Skype Cost @ £1 per minute	£71.00	£70.00	£79.00	£78.00	£69.00		£83.00	£64.00	£60.00	£64.00			
Mileage	0	0	0	0	0	23	0	0	0	0			
Mileage Cost @	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42	£0.42			
Mileage Expense	£0.00	£0.00	£0.00	£0.00	£0.00	£9.66	£0.00	£0.00	£0.00	£0.00			
F2F Total Costs						£147.66					147.66		
Skype Total Costs	£71.00	£70.00	£79.00	£78.00	£69.00		£83.00	£64.00	£60.00	£64.00	638.00		

F2F Therapy Time						40					40.00		
SkypeTherapy Time	30	32	40	39	39		37	34	34	34	319.00		
F2F cost per min						£3.69						£3.69	1.00
Skype cost per min	£2.36	£2.19	£1.98	£2.00	£1.77		£2.24	£1.88	£1.76	£1.88		£2.00	3.00
Rating Total for F2F Sessions out of a max of 20													18.00
Rating Total for Skype Sessions													18.56

Appendix 18: Costs Per Minute for 60 Minute Skype and F2F Speech and Language Therapy Sessions

		1	2	3	4	5	6	7	8	9	Average
1JF	Skype £pm	£1.53	£1.61	£1.48	£1.64	£1.41					£1.53
	Total	£92.00	£116.00	£102.00	£95.00	£113.00					
	F2F £pm	£2.06	£2.16	£2.71	£2.26	£2.22					£2.28
	Total	£115.30	£148.72	£159.72	£155.70	£131.14					
2JM	Skype £pm	£1.66	£1.90	£1.77	£1.78	£1.41	£1.58	£1.70			£1.69
	Total	£108.00	£114.00	£106.00	£114.00	£99.00	£93.00	£102.00			
	F2F £pm	£4.26	£3.01	£3.72							3.64
	Total	£225.90	£180.64	£241.90							
3JM	Skype £pm	£1.63	£1.62	£1.39	£1.53	£1.70					£1.58
	Total	£106.00	£94.00	£85.00	£92.00	£102.00					
	F2F £pm	£3.29	£2.74	£2.95	£2.88	£3.00					£2.97
	Total	£190.64	£158.86	£165.25	£172.56	£180.22					
4SM	Skype £pm	£1.73	£1.78	£1.53	£1.92	£1.69	£2.00	£1.65	£1.59		£1.73
	Total	£121.00	£107.00	£107.00	£115.00	£113.00	£110.00	£99.00	£99.00		
	F2F £pm	£3.59	£2.99								£3.25
	Total	£215.64	£238.80								
5SM	Skype £pm	£1.70	£1.73	£1.85	£1.61	£1.69					£1.72
	Total	£85.00	£90.00	£113.00	£92.00	£110.00					
	F2F £pm	£2.58	£2.97	£2.76	£3.10	£2.91					£2.86
	Total	£180.28	£187.28	£179.28	£210.70	£174.32					

Key:

£pm = £ sterling per minute Total = total costs to provide the session

Appendix 18: Costs Per Minute for 30 Minute Skype and F2F Speech and Language Therapy sessions

		1	2	3	4	5	6	7	8	9	Average
6JF	Skype £pm	£1.92	£2.26	£1.74	£1.83	£1.75	£1.97	£1.70	£1.97		£1.89
	Total	£75.00	£79.00	£75.00	£55.00	£70.00	£75.00	£68.00	£73.00		
	F2F £pm	£5.10	£3.86								£4.44
	Total	£152.88	£131.56								
7JM	Skype £pm	£2.33	£1.75	£1.53	£1.88	£1.53	£1.71				£1.77
	Total	£70.00	£70.00	£61.00	£77.00	£58.00	£72.00				
	F2F £pm	£2.94	£3.57	£3.42	£3.57						£3.34
	Total	£88.14	£89.88	£105.98	£92.88						
8SM	Skype £pm	£2.11	£2.31	£2.35	£1.78	£2.09	£2.17	£2.00	£2.47	£2.00	£2.14
	Total	£74.00	£74.00	£94.00	£71.00	£73.00	£76.00	£70.00	£74.00	£60.00	
	F2F £pm	£4.38									£4.38
	Total	£175.25									
9IM	Skype £pm	£3.10	£3.25	£2.39	£2.70	£2.55	£2.33	£2.13			£2.58
	Total	£62.00	£65.00	£55.00	£81.00	£79.00	£70.00	£66.00			
	F2F £pm	£2.95	£3.27	£3.49							£3.24
	Total	£88.46	£97.98	£104.72							
10JF	Skype £pm	£1.88	£1.90	£2.08	£2.20	£2.11	£2.20	£1.95	£2.37		£2.08
	Total	£75.00	£80.00	£77.00	£66.00	£95.00	£66.00	£72.00	£90.00		
	F2F £pm	£3.74	£4.39								£4.10
	Total	£130.96	£188.74								
11SF	Skype £pm	£2.36	£2.19	£1.98	£2.00	£1.77	£2.24	£1.88	£1.76	£1.88	£2.00
	Total	£71.00	£70.00	£79.00	£78.00	£69.00	£83.00	£64.00	£60.00	£64.00	
	F2F £pm	£3.69									£3.69
	Total	£147.66									

Appendix 19: Main Study Questionnaire Response Ratings

Participant	1JF - 1	1JF - 2	2JM - 1	2JM - 2	3JM - 1	3JM - 2	4SM - 1	4SM - 2	5SM – 1	5SM - 2	5SM - 1	5SM - 2
	Parent		Parent		Parent		Parent		Parent		Professional	
Acceptability Measures Rating from Questionnaire Responses				1 and 2 = 2		3 to 5 = 1		6 and 7 = 0				
Technology Acceptability												
hearing acuity (reversed rating = RR)	2	2	0	2	2	2	1	1	2	2	1	0
assistance needed (RR)	2	2	1	2	2	1	2	2	0	2	0	1
visual acuity	2	2	1	2	2	2	1	2	0	2	2	2
Happy to continue	2	2	2	2	2	0	1	2	1	2	2	2
TOTAL (out of 8)	8	8	4	8	8	5	5	7	3	8	5	5
Interaction												
less time to talk to Speech and Language Therapy (RR)	1	2	0	2	1	1	2	2	2	2	0	0
talk with ease	1	2	2	2	2	1	0	2	1	2	2	0
child can understand Speech and Language Therapy just the same	1	1	1	1	2	2	0	2	1	2	1	1
child less able to concentrate (RR)	2	2	1	1	2	1	1	2	1	2	1	1
Therapist able to respond to mood	2	2	2	2	2	1	0	2	1	2	1	2
Therapist less able to interact with child (RR)	2	2	1	1	2	2	0	1	1	2	0	1
Satisfied with interaction	2	2	2	2	2	2	0	2	1	2	1	1
TOTAL (out of 14)	11	13	9	11	13	10	3	13	8	14	6	6
Sessions												
able to access Speech and Language Therapy thru SKYPE better	1	2	2	2	1	1	2	2	1	1	2	1
Skype Speech and Language Therapy sessions fit in well	2	2	2	2	2	2	2	2	2	2	2	1

Receive adequate attention from Therapist	2	2	1	2	1	1	2	2	2	2	1	0
Able to make contact more readily	1	2	1	2	2	2	2	1	1	2	1	1
more involved in SKYPE Speech and Language Therapy than F2F	0	2	2	2	2	2	2	0	1	1	1	0
Skype Speech and Language Therapy consistently the same	2	2	2	2	2	2	0	1	2	2	2	2
Skype Speech and Language Therapy enable child to develop	2	2	0	2	2	1	2	2	2	2	1	1
Progress same in SKYPE as F2F	2	2	1	0	1	1	1	1	1	2	1	1
Skype Speech and Language Therapy activities as enjoyable	2	2	2	1	2	1	2	1	2	2	2	1
Skype Speech and Language Therapy acceptable	2	2	2	2	2	1	2	2	1	2	2	1
TOTAL (out of 20)	16	20	15	17	17	14	17	14	15	18	15	9
Total 1st views	35		28		38		25		26		26	
Total 2nd Views		41		36		29		34		40		20
0 – 10 = Least acceptable	11 – 30 = mid range acceptable						>31 = most acceptable					

Participant	6JF - 1	6JF - 2	7JM - 1	7JM - 2	8SM - 1	8SM - 2	9IM - 1	9IM - 2	10JF - 1	10JF - 2	11SF - 1	11SF - 2
	Parent		Parent		Parent		Parent		Parent		Parent	
Acceptability Measures Rating from Questionnaire Response 1 and 2 = 2 3 to 5 = 1 6 and 7 = 0												
Technology Acceptability												
hearing acuity (reversed rating = RR)	2	2	1	2	2	1	1	2	2	1	2	2
assistance needed (RR)	1	2	1	2	2	2	2	2	2	2	1	1
visual acuity	2	2	2	1	1	2	1	2	2	2	1	2
Happy to continue	2	2	1	1	2	2	2	2	2	2	2	2
TOTAL (out of 8)	7	8	5	6	7	7	6	8	8	7	6	7
Interaction												
less time to talk to Speech and Language Therapy (RR)	2	2	1	2	2	2	2	2	1	2	1	2
talk with ease	2	2	1	0	2	2	2	2	0	0	1	2
child can understand Speech and Language Therapy just the same	2	2	1	0	2	2	1	2	2	2	2	2
child less able to concentrate (RR)	2	2	1	2	2	2	1	2	2	1	1	2
Therapist able to respond to mood	2	2	0	0	2	2	1	2	1	1	1	2
Therapist less able to interact with child (RR)	2	2	2	2	2	2	1	2	2	1	1	2
Satisfied with interaction between Speech and Language Therapy and child	2	2	1	2	2	2	1	2	2	2	2	2
TOTAL (out of 14)	14	14	7	8	14	14	9	14	10	9	8	14
Sessions												
able to access Speech and Language Therapy thru Skype better than F2F	1	1	1	1	2	1	1	2	1	0	2	2
Skype Speech and Language Therapy sessions fit in well	2	2	1	2	2	2	2	2	2	1	2	2
Receive adequate attention from Therapist	2	2	1	2	2	2	2	2	0	0	2	2
able to make contact more readily	2	2	1	2	2	2	1	2	1	0	2	2
more involved in SKYPE Speech and Language Therapy than F2F	2	2	1	1	2	1	1	2	2	2	1	2

Skype Speech and Language Therapy consistently the same	2	2	1	2	2	2	2	2	1	2	1	2
Skype Speech and Language Therapy enable child to develop	2	2	1	1	2	2	2	2	2	1	2	1
Progress same in SKYPE as F2F	2	2	1	2	2	2	2	2	1	1	2	2
Skype Speech and Language Therapy activities as enjoyable	2	2	2	2	2	2	2	2	1	1	2	2
Skype Speech and Language Therapy acceptable	2	2	1	1	2	2	2	1	2	2	2	2
TOTAL (out of 20)	19	19	11	16	20	18	17	19	13	10	18	19
Total 1st views	40		23		41		32		31		32	
Total 2nd Views		41		30		39		41		26		40
0 - 10 = least acceptable	11 - 30 = mid range acceptable						>31=most acceptable					

Appendix 20: Main Study Expanded Comments on Pre Trial Questionnaire

Comments & observations on using Skype:

'My expectation is that it will be difficult and frustrating. This is with respect to the core element of Speech and Language Therapy working in 2 dimensions (visual) and half depleted voice (only one person can speak at a time) plus the delay in transmission.' (4SM)

'I have concerns that it may not be as easy to maintain my child's attention or to refocus when attention has wandered.' (5SM – parent)

'I initially felt a little apprehensive as I had not used Skype previously.' (6JF)

'I think it is more fun as using he computer is different. Much more relaxed approach – happy to be in own home.' (8SM)

'I think it will be more difficult for me to get information on 10JF's progress, to ask questions using Skype sessions. If I was physically present in the room, I could ask questions when we arrived or when we were leaving the house. Because we are limited on time (and because 10JF is present and listening) I don't feel comfortable in asking extra questions. It's also more stressful for me as I make sure we've got everything to hand, helping 10JF during the session with game pieces. (compared to turning up at your house and relaxing in the chair!)' (10JF)

'May have some technology difficulties.' (11SF)

Comments & observations about interaction:

'It is different through Skype but it makes 3JM concentrate more when using Skype and he has really enjoyed the sessions so far' (3JM)

'My expectation is that Skype will be less effective than F2F for Speech and Language Therapy.' (4SM)

'I believe my daughter will be more relaxed in these sessions and open to learning. She found it difficult/embarrassing to excuse herself from class for Speech and Language Therapy sessions.' (6JF)

'Most of my answers are a bit middle of the road. This is because I really don't know how well the session will go and whether there will be any changes.' (7JM)

'Interaction is as easy as F2F Speech and Language Therapy sessions; can see therapist + follow instructions easily.' (8SM)

Comments & observations about how the Speech and Language Therapy sessions will be provided using Skype:

'We are still getting used to our Skype sessions as I is still new to us, but so far has been very successful and enjoyable' (3JM)

'5SM is very able on a computer and likes using them. I think getting him to talk to it will be the only concern but he learns quickly.' (5SM –professional)

'Happy to use Skype in Speech and Language Therapy sessions. Achieve as much as F2F sessions.' (8SM)

Anticipated Benefits to Speech and Language Therapy sessions through Skype:

'less travel, less time wasted, less school disturbance, more efficient way of helping' (2JM)

'Benefits = cost, travel time, carbon footprint, the half duplex nature of Skype may be a benefit because you cannot cut in, easier for parent to communicate with therapist, 4SM likes computers it adds street cred to Speech and Language Therapy.' (4SM)

'I think the benefits are: 1) 5SM can do Speech and Language Therapy in school or at home and 2) he likes using a computer and he may feel more at ease because he will not have to be in a strange environment.' (5SM – professional)

I think that the Skype sessions are a good way to engage adolescents with autism as the clearly enjoy time with screens far more than time with people. Learning from computers is very effective for youngsters with ASD. The youngster is able to concentrate on the learning rather than the distractions of people etc…..' (5SM – parent)

'Benefits – 1) fits in easily to lifestyle, 2) comfortable in own environment 3) fun factor as new 4) get more done in time allowed & 5) can see and hear clearly.' (8SM)

'Benefits = convenience, less travel time and potential equally effective as F2F.' (10JF)

'Able to continue sessions despite moving abroad an ideal to allow focus on child's need for improved auditory skills i.e. poor phonic skills discovered at recent psychological testing for dyslexia.' (11SF)

Anticipated Drawbacks to Speech and Language Therapy sessions through Skype:

'The only drawback is you don't see someone F2F and I have to prepare more for 3JM's sessions which can be challenging for me as I'm not very good on the computer' (3JM)

'Interaction is less fluid, visual is 2 dimensional, audio is half duplex, cannot work on same physical object (game board), it must be difficult to sing if you use that in the therapy, Skype sometimes is unavailable or drops in service.' (4SM)

'5SM is very complex – he can vary widely on how he responds to things, his moods can change very fast especially if anything goes wrong.' (5SM – professional)

It will be harder to redirect when youngsters lose concentration or disengage.' (5SM – parent)

'Benefits for me was to be involved in sessions and observe what methods were being used by therapist. These methods can then be used at home to further my daughter's speech & language development.' (6JF)

'Sometimes can't see activity board very clearly and some distortion - not often.' (8SM)

'Drawbacks = less easy to ask questions on 10JF's progress, more hassle for me to organize (although that is far outweighed with reduced travel time i.e. no travel)

Final miscellaneous comments & observations on Skype and F2F Speech and Language Therapy sessions

'I am very grateful and pleased that you are doing this for 4SM – please keep it up.' (4SM)

‘Overall I think this is a very exciting project. I think it would open up opportunities for children to access Speech and Language Therapy. I am very interested in the final results.’ (5SM – parent)

‘My child has enjoyed each session and has been very enthusiastic.’ (11SF)

Appendix 21: Main Study Expanded Comments on Post Trial Questionnaire

Comments & observations on using Skype:

'It helps 2JM to concentrate and focus, to speak more clearly, to problem solve, to work on his dynamic thinking and eventually his memory and finally his expressive language.' (2JM)

'We enjoyed the Skype sessions very much once we knew how to work everything correctly. I just didn't feel 3JM got as much out of a SKYPE sessions as F2F session. He enjoys the F2F sessions more and stays more focused in them.' (3JM)

'In general it works well. 4SM like the computer and he likes you so it's a good experience.' (4SM)

'Find Skype sessions much easier to fit into routine. Enjoy using the technology. My child is relaxed when using SKYPE. Sometimes difficult to see all cards, number etc on the whiteboard. Enjoyed the sessions as much as F2F Speech and Language Therapy. Find Skype sessions less time consuming as immediate interaction occurs.' (8SM)

'I used video conferencing software briefly, a long time ago. I remembered the sound used to break up frequently & wondered if Skype would be the same. I also remember that voices sounded muffled and 'metallic' because they were heavily compressed. This is not the case with Skype as voices more natural.' (9IM)

'Skype seems to be a robust tool. Sometimes I think some of the visual material needs to be bigger, as small details, numbers on cards can appear blurred and small. It's sometimes difficult not to talk over others. I know this is a problem with audio only conference calls, but I think it's a bit of a problem with visual conferencing too.'(9IM)

Comments & observations about interaction:

'Interaction has been positive over the Skype Speech and Language Therapy sessions. My son is relaxed and enjoys using the computer. It has been positive for him. He is happy with Skype as much as F2F Speech and Language Therapy.' (8SM)

9IM seems to be communicating more in the Skype sessions than in the F2F sessions. He's communicating more in general too.' (9IM)

Comments & observations about the Speech and Language Therapy sessions provided using Skype:

'I think the mix of Skype and F2F works best' (1JF)

'I would say Skype is a very useful option to have. All things compared I would always prefer F2F but Skype is an option for more convenient appointment times. It makes much better use of the therapist's time. It also means the therapist does not need elaborate facilities for visiting clients. Hopefully a reduced hourly fee would result!!' (2JM)

'5SM really looks forward to his Skype sessions. We were able to continue with sessions even when snow bound. Brilliant!' (5SM – parent)

'Skype has been positive for my son. He has enjoyed them as much as F2F. Some materials are not clear on the white board due to lighting however he has understood the games and has not struggled to follow instructions. There has been a benefit in his language as he is

attempting much longer sentences in his speech. The Skype sessions have always been without any problems i.e. technology failing etc…' (8SM)

'I think it's possible to increase the frequency of sessions using Skype. As technology is always advancing it might be possible to develop new forms of interaction between the therapist and child.' (9IM)

Identified Benefits on using Skype:

'Challenging 2JM to speak more clearly, to think faster and out of the box and it helped with his awareness and socialization.' (2JM)

'1) less travelling time for therapist or parent 2) Speech and Language Therapy able to do more sessions per day 3) child feels more grown up using Skype 4) parent gets to see techniques and exercises as has to be present with Skype but not F2F sessions so this facilitates carry over work & 5) Skype may encourage the child to learn to concentrate more eventually.' (2JM)

'More beneficial with timing and emails. Unfortunately I'm not good on the computer so it was all a bit lost on me. 3JM liked using the Skype system. We enjoyed trying out the Skype sessions.' (3JM)

'It has made family logistics simpler.' (4SM)

'Skype sessions mean child is more focused – has only the screen to concentrate on and no auditory distractions via earphones. Skype sessions were available even when snowbound. Less travel time for child/therapist means more environmentally friendly and can reach more children. Like the fact that session are followed up with emails – easy access to ask questions after the sessions.' (5SM – parent)

'The benefit for my child is that she is more relaxed about the SKYPE sessions and this makes it more favourable for her learning.' (6JF)

'7JM seems to be able to concentrate more and for longer periods of time. I have purposely tried to avoid any assistance in order to push 7JM and I think the result were encouraging.' (7JM)

Benefits – 1) less intrusive on time 2) convenient for busy schedules 3) fun and using technology that children love & 4) can be anywhere so locations more flexible as long as access to PC + Skype.' (8SM)

'9IM enjoys talking to people on screen and stays engaged longer than he would do in the F2F sessions.' (9IM)

Benefits to Skype = my child is less likely to get embarrassed and act up using Skype rather than F2F. My child has sometimes got over excited during F2F sessions and SKYPE keeps things more under control.' (10JF)

'Good timings fit in with schedule and provided continuous contact despite moving abroad.' (11SF)

Identified Drawbacks on using Skype:

'1) usually small technical faults (= frustration and time lost) 2) much less scope for broadband communication i.e. facial expressions, non verbal gestures 3) parent has to sit in (an hour of their time) & 4) equipment costs and time to prepare duplicate sets of materials.' (2JM)

'Drawbacks – 1) sometimes sound issues due to connections although resolved 2) clarity of games not always clear on white board & 3) relying on technology which may let you down although hasn't in my case.' (8SM)

Drawbacks to Skype = more difficult to discuss progress (as child listening in) and child has no chance to choose activities so less likely to be engaged in activity.' (10JF)

Final comments & observations on Skype and F2F Speech and Language Therapy sessions:

'It is easier but less challenging but the combination works very well.' (2JM)

'Personally I felt out of the two 3JM benefits more from F2F sessions and needs one to one.' (3JM)

'Thank you Rebecca for the work you are doing with 4SM, he enjoys it and looks forward to it very much.' (4SM)

'Brilliant idea!' (5SM – parent)

'The balance of Skype and F2F that my child currently receives is right for her. My child currently feels enthusiastic and motivated about her sessions.' (6JF)

'Enjoyed Skype sessions as much as F2F Speech and Language Therapy. Has been fun and different in a positive way.' (8SM)

'The camera used for our sessions stands on top of our computer. I wonder if its possible for a therapist to see if my son's eye contact is improving or not.' (9IM)

'My child is very happy doing Skype sessions and looks forward to them just as much as F2F.' (10JF)

'Good rapport achieved.' (11SF)

Appendix 22: Main Study Child Participant Interview Response Ratings

1	**Computer Competency**		1JF	2JM	3JM	4SM	5SM	6JF	7JM	8SM	10JF	11SF	Total Responses
A	6 hours or more	1		1	1		1			1			4
	5 hours or less	0	0			0		0	0		0	0	6
B	5 or more activities	2					2		2	2		2	3
	3 or 4 activities	1	1		1	1		1					4
	<2 activities on computer	0		0							0		3
C	8, 9 & 10 skill rating	2		2	2		2						3
	4 - 7 or skill rating	1	1			1		1	1	1		1	6
	1, 2 or 3 skill rating	0									0		1
D	Independent User	2				2						2	2
	Some support needed	1	1	1	1		1	1	1	1	1		8
	Non independent User	0											0
E	Previously used Skype	1	1			1		1			1	1	5
	No use of Skype	0		0	0		0		0	0			5
	Competency Rating out of 8		4	4	5	5	6	4	4	5	2	6	
	0 - 2 = weak										1		1
	3 - 5 = average		1	1	1	1		1	1	1			7
	6 - 8 = most competent						1					1	2

2	**Technology**		1JF	2JM	3JM	4SM	5SM	6JF	7JM	8SM	10JF	11SF	Total Responses
A	Visual Acuity OK	2		2	2	2	2	2	2	2	2	2	9
	undecided	1	1										1
	not able to see clearly	0											0
B	Improvements not needed	2			2	2	2	2		2	2	2	7
	undecided	1		1									1
	Improvements needed	0	0						0				2
C	Auditory Acuity OK	2		2	2	2	2	2	2		2	2	8
	undecided	1	1										1
	hard to hear	0								0			1
D	Improvements not needed	2	2			2	2	2	2		2	2	7
	undecided	1		1	1								2
	Improvements needed	0								0			1
	Technology Rating (range 0 – 8)		4	6	7	8	8	8	6	4	8	8	
	0 - 2 = weak												8
	3 - 5 = average		1							1			2
	6 - 8 = satisfactory			1	1	1	1	1	1		1	1	8

3	**Interaction**		1JF	2JM	3JM	4SM	5SM	6JF	7JM	8SM	10JF	11SF	Total Responses
A	Follow RM instructions	2	2		2			2	2	2	2	2	7
	undecided	1		1		1	1						3
	Not able to follow	0											0
B	Say what you wanted	2	2	2	2	2	2	2	2	2	2	2	10
	undecided	1											0
	not say what you wanted	0											0
C	able to talk to therapist	2	2	2	2	2	2	2	2	2	2	2	10
	undecided	1											0
	not able to talk to therapist	0											0
D	Therapist responded to you	2	2	2	2	2		2	2	2	2	2	9
	undecided	1					1						1
	Therapist misunderstood	0											0
E	F2F & Skype talking same	2				2				2	2		3
	undecided	1	1										1
	F2F & Skype talking different	0		0	0		0	0	0			0	6
	Interaction Rating (0 – 10)		9	7	8	9	6	8	8	10	10	8	
	0 - 2 = not satisfactory												0
	3 - 7 = average			1			1						2
	8 - 10 = satisfactory		1		1	1		1	1	1	1	1	8

4	**Therapy Sessions on Skype**		1JF	2JM	3JM	4SM	5SM	6JF	7JM	8SM	10JF	11SF	Total Responses
A	Like Skype Therapy activities	2	2	2	2	2	2	2	2	2	2	2	10
	undecided	1											0
	did not like Skype activities	0											0
B	Activities okay/no view	2	2	2				2		2	2	2	6
	Activities easy to do	1			1				1				2
	Activities on Skype too hard	0				0	0						2
C	at least 1 activity better	0	2	2	2	2			2	2	2		7
	No activities specified	1					1	1				1	3
	preference for F2F activities	2											0
	Activities Rating (range 0 – 6)		6	6	5	4	3	5	5	6	6	5	
	0 - 1 = not satisfactory												0
	2 - 4 = okay					1	1						2
	5 - 6 = satisfactory		1	1	1			1	1	1	1	1	8

5	**Acceptability**		1JF	2JM	3JM	4SM	5SM	6JF	7JM	8SM	10JF	11SF	Total Responses
A	Like Skype session	2	2	2	2	2	2	2	2	2	2	2	10
	undecided	1											0
	Prefer F2F	0											0
B	Skype & F2F same	2	2	2					2	2	2	2	6
	Undecided	1						1					1
	Skype & F2F not same	0			0	0	0						3
C	Easy to fit in	2	2	2	2	2	2	2	2	2	2	2	10
	undecided	1											0
	not easy to fit in	0											0
D	Did not miss out activities	2	2		2	2	2	2	2	2	2	2	9
	undecided	1		1									1
	did miss out on activities	0											0
E	Did not miss lessons	1	1	1	1	1	1	1	1	1	1	1	10
	missed lessons	0											0
F	Prefer Skype	2		2	2	2	2	2		2			6
	No preference	1	1						1				2
	Preferred F2F	0									0	0	2
G	Continue Skype	1	1	1	1	1	1	1	1	1	1	1	10
	not continue Skype	0											0
	Acceptable Rating (0 - 12)		11	11	10	10	10	11	11	12	10	10	
	0 - 2 = not acceptable												0
	3 - 9 = average												0
	10 - 12 = acceptable		1	1	1	1	1	1	1	1	1	1	10

Appendix 23: Main Study Expanded Comments of the Child Participants interviewed

Comments & observations on the technology using Skype:

2c Could anything have been improved about the picture or sound?

'Making it less fuzzy.' (1JF)
'I couldn't see the red ones they looked like black and the blue ones looked like black.' (7JM)
'size of pictures displayed on whiteboard.' (9IM's mother)

Comments & observations about interaction:

'It's okay but sometimes your voice went funny so I didn't hear.' (1JF)
'Good as you have to communicate more because you can't move or point.' (4SM)
'He's not inhibited and he says what he wants to just as if you were face-to-face with him.' (9IM's mother)
'I think he's intrigued by seeing you on a computer.' (9IM's mother)

Comments & observations about how the Speech and Language Therapy sessions will be provided using Skype:

4b Were there any games that you particularly liked in the Skype sessions?

'Cluedo. Amy's Wardrobe. Colouring (Alert Listening & Developing Listening Skills).' (1JF)
'Guess Who? Colouring (Alert Listening, Developing Listening Skills).' (2JM)
'Cluedo' (3JM)
'liked Sudoku; nothing much changed but I had to speak more; it was good for me as it was harder' (4SM)
'Debates and Cluedo.' (4SM)
'Cluedo.' (5SM)
'Cluedo & Listening Sheets.' (6JF)
'Goblet Kid.' (7JM)
'I think Penguin Pile up would be good on SKYPE as I found it hard to hold the penguins.' (8SM)
'Colouring and Guess Who?' (9IM's mother)
'Guess Who? because it is more fun & nobody can sneak a look.' (10JF)
'Mastermind & Three in a Team.' (11SF)

4e Were any activities better in the F2F sessions?'

'Cluedo …… because you could feel it.' (1JF)
'Pass the Bomb ……. you can feel the bomb' (4SM)
'Cluedo ….. move the bits around.' (6JF)
'Sonny the Seal. Connect 4.' (7JM)
'Cluedo …. because you could feel them.' (8SM)
'Cluedo because you can throw the dice and move into the rooms rather than just going to the rooms and In Your Face because Mu, sprayed us with water.' (10JF)
'Not much difference.' (11SF)

Good reasons to use Skype to have Speech and Language Therapy sessions:

'Liked getting the certificates better than the sticker.' (3JM)
'Fits in. Work harder. Communicate more. Don't miss lessons.' (4SM)
'Don't like coming out of lessons and having to tell my friends why I am going out.' (6JF)

‘have Mum and Dad here.’ (6JF)
‘flexible…. more things done….’ (8SM)
‘Better focused in Skype’ (9IM’s mother)
‘No twiddlers and he finds it easier to leave to one side.’ (9IM’s mother)
‘Practical. Be at home for sessions. As soon as you are finished you can move onto the next thing. Works as good as F2F.’ (11SF)

Good reasons to have F2F Speech and Language Therapy sessions:

‘Good and maybe necessary if you don’t know the therapist.’ (4SM)
‘Like F2F cos then I don’t have to get the box ready’ (6JF)
‘More fun.’ (10JF)
‘Can see more of the other person; see expressions better and talk for longer.’ (11SF)

Other Observations

‘Sharing games on a computer screen.’ (6JF)
‘See the board better.’ (6JF)
‘More activities done in the session but fewer repetitions of the games so might keep 7JM better focused than in F2F sessions.’ (7JM’s father)
‘7JM rose to challenge and more of his effort or work in the responses.’ (in the SKYPE sessions) (7JM’s father)
‘7JM needs less support to answer and fewer reminders to keep on task.’ (7JM’s father)
‘ 8SM hadn’t objected to the Skype sessions and felt his behaviour in the sessions shows he is comfortable. I wonder if he would have struggled with an hour slot …. whether the headphones would be uncomfortable to wear for an hour.’ (8SM’s mother)

Appendix 24: Main Study Transcription Management Record

ID	Session Format	Record Date	Length	Bk	Trans-criber	Veri-fied	Typist	1st Coder	2nd Coder
1JF	Skype	3/11/09	60 mins	1	JM	100%	RM	JM	RM
	F2F	20/10/09		3/4	JM	100%	HCM	RM	JM
2JM	Skype	19/10/09	60 mins	1/2	JM	100%	JM	RM	JM
	F2F	23/10/09		4/7	LG	100%	JM	JM	RM
3JM	Skype	19/4/10	60 mins	6	JM	100%	JM	JM	RM
	F2F	22/3/10		2	JM	100%	HCM	RM	JM
4SM	Skype	16/3/10	60 mins	3	JM	100%	HCM	RM	JM
	F2F	20/4/10		5	JM	100%	JM	JM	RM
5SM	Skype	18/12/09	60 mins	4/5	JM	100%	JM	JM	RM
	F2F	11/12/09		6	JM	100%	JM	RM	JM
6JF	Skype	9/3/10	30 mins	4	LG	100%	JM	RM	JM
	F2F	3/3/10		2	JM	98%	HCM	RM	JM
7JM	Skype	10/12/09	30 mins	3	RM	100%	HCM	RM	JM
	F2F	1/12/09		1	JM	100%	JM	JM	RM
8SM	Skype	22/2/10	30 mins	2	JM	96%	HCM	JM	RM
	F2F	1/2/10		4	JM	99%	JM	RM	JM
9IM	Skype	29/6/10	30 mins	7/8	JM	97%	JM	RM	JM
	F2F	8/6/10		5	JM	99%	JM	JM	RM
10JF	Skype	29/5/10	30 mins	5	JM	100%	JM	RM	JM
	F2F	8/6/10		6/7	JM	100%	JM	JM	RM
11SF	Skype	21/6/10	30 mins	7	JM	100%	JM	JM	RM
	F2F	5/7/10		7	JM	100%	JM	RM	JM

Appendix 25: Table of Reliability Coding of Main Study Transcription

	Session Format	1st Coder	2nd Coder	1st Reliability 1st Agreement	1st Reliability 2nd Agreement	2nd Reliability 1st Agreement	2nd Reliability 2nd Agreement
IJF	Skype	JM	RM	M = 74%	M =99%	M = 87%	M = 91%
				F = 80%	F = 98%	F = 91%	F = 97%
	F2F	RM	JM	M = 91%	M = 97%	M = 80%	M = 91%
				F = 78%	F = 99%	F = 96%	F = 97%
2JM	Skype	RM	JM	M =88%	M = 98%	M = 86%	M = 93%
				F = 89%	F = 97%	F = 99%	F = 99%
	F2F	JM	RM	M = 90%	M = 100%	M = 96%	M = 97%
				F = 92%	F = 99%	F = 98%	F = 98%
3JM	Skype	JM	RM	M = 90%	M = 99%	M = 98%	M = 98%
				F = 92%	F = 99%	F = 99%	F = 99%
	F2F	RM	JM	M = 88%	M = 100%	M = 93%	M = 95%
				F = 88%	F = 98%	F = 98%	F = 99%
4SM	Skype	RM	JM	M = 93%	M = 96%	M = 90%	M = 99%
				F = 85%	F = 96%	F = 100%	F = 94%
	F2F	JM	RM	M = 84%	M = 91%	M = 100%	M = 100%
				F = 88%	F = 95%	F = 99%	F = 100%
5SM	Skype	JM	RM	M = 94%	M = 95%	M = 98%	M =98%
				F = 93%	F = 97%	F = 100%	F = 100%
	F2F	RM	JM	M = 86%	M = 98%	M = 94%	M =98%
				F = 82%	F = 99%	F = 95%	F = 100%
6JF	Skype	RM	JM	M = 91%	M = 100%	M = 85%	M = 98%
				F = 84%	F = 98%	F = 91%	F = 100%
	F2F	RM	JM	M = 94%	M = 100%	M = 92%	M = 100%
				F = 95%	F = 100%	F = 89%	F = 98%
7JM	Skype	RM	JM	M = 93%	M =97%	M = 90%	M = 96%
				F = 95%	F = 99%	F = 89%	F = 99%
	F2F	JM	RM	M =93%	M = 99%	M = 85%	M = 94%
				F = 90%	F = 98%	F = 87%	F = 99%
8SM	Skype	JM	RM	M = 98%	M = 100%	M = 93%	M = 98%
				F = 98%	F = 98%	F = 87%	F = 98%
	F2F	RM	JM	M = 91%	M = 100%	M = 87%	M =95%
				F = 85%	F = 98%	F = 93%	F = 99%
9IM	Skype	RM	JM	M = 92%	M = 97%	M = 89%	M = 100%
				F = 86%	F = 99%	F = 90%	F = 99%
	F2F	JM	RM	M = 97%	M = 99%	M = 97%	M = 99%
				F = 95%	F = 97%	F = 91%	F = 99%
10JF	Skype	RM	JM	M = 90%	M = 100%	M = 94%	M = 100%
				F = 93%	F = 98%	F = 92%	F = 98%
	F2F	JM	RM	M = 88%	M =98%	M = 89%	M = 100%
				F = 91%	F = 98%	F = 94%	F = 99%
11SF	Skype	JM	RM	M = 91%	M = 100%	M = 86%	M = 98%
				F = 89%	F = 98%	F = 91%	F = 100%
	F2F	RM	JM	M = 94%	M =98%	M = 90%	M =100%
				F = 80%	F = 97%	F = 89%	F = 99%

Key:

M = Turn Move codes F = Function Utterance codes

Appendix 26: Main Study Individual Participant Discourse Total Number Count Data

Session Type	Skype					F2F				
Speaker	Therapist	1JF	Parent	Nanny	TOTAL	Therapist	1JF	Parent	Nanny	TOTAL
Turns	356	341	Not present	3	700	370	370	Not present		740
I	19	25		0	44	51	60			111
R/I	16	9		0	25	25	14			39
F/I	196	82		0	278	132	85			217
R	29	116		0	145	46	75			121
F	69	109		3	181	116	137			253
Interruptions from	2	5		0	7	6	20			26
Interruptions to	5	2		0	7	20	6			26
Overlaps					46					8
Utterances	958	553		3	1514	744	566			1310
Words	5573	2112		12	7697	4025	2614			6639
MLU	6.32	4.14		4	14.46	5.59	5.08			10.67
Other Group TOTAL	165	146		0	311	120	141			261
NSSE	33	12		0	45	11	36			47
NACK	75	20		0	95	47	34			81
NCD	57	59		0	116	62	55			117
Nunintell	0	55		0	55	0	16			16
Provisions TOTAL	587	308		3	898	386	256			642
PI	458	245		3	706	264	194			458
PF	22	1		0	23	36	2			38
PP	1	0		0	1	26	1			27
Clarifications	50	18		0	68	39	31			70
PS	56	44		0	100	21	28			49
Requests TOTAL	206	99		0	305	238	169			407
Clarification	24	19		0	43	7	1			8
RI	142	74		0	216	86	83			169
ROA	11	5		0	16	108	74			182
RJA	29	1		0	30	37	11			48

Session Type	Skype						F2F				
Speaker	Therapist	2JM	Dad	Mum	Sister	TOTAL	Therapist	2JM	Dad	Mum	TOTAL
Turns	308	283	49	140	5	785	226	225			451
I	20	5	8	4	0	37	8	1	Not Present		9
R/I	7	6	1	0	0	14	3	4			7
F/I	182	19	22	36	1	260	168	8			176
R	10	177	2	9	1	199	1	78			79
F	89	76	16	91	3	275	49	134			183
Interruptions from	0	6	4	8	0	18	2	6			8
Interruptions to	13	5	0	0	0	18	6	2			8
Overlaps						27					9
Utterances	813	327	59	178	10	1387	842	262			1104
Words	6790	541	219	580	18	8148	5714	45			5759
MLU	8.69	1.8	3.71	3.33	1.8	19.33	7.21	1.88			9.09
Other Group TOTAL	114	93	5	48	0	260	67	66			133
NSSE	22	6	0	5	0	33	13	6			19
NACK	34	6	0	10	0	50	13	6			19
NCD	58	81	4	32	0	175	41	32			73
Nunintell	0	0	1	1	0	2	0	22			22
Provisions TOTAL	480	197	21	98	9	805	558	179			737
PI	262	116	7	20	5	410	402	112			514
PF	44	0	2	0	0	46	48	0			48
PP	50	0	8	54	0	112	31	0			31
Clarifications	110	32	4	22	4	172	32	23			55
PS	14	49	0	0	0	63	45	44			89
Requests TOTAL	219	37	33	32	1	322	217	17			234
Clarification	10	0	0	5	0	15	13	6			19
RI	149	28	10	7	0	194	89	7			96
ROA	36	8	23	11	1	79	98	4			102
RJA	24	1	0	9	0	34	17	0			17

Session Type	Skype			
Speaker	Therapist	3JM	Parent	TOTAL
Turns	278	279	35	592
I	31	58	8	97
R/I	0	0	0	0
F/I	122	2	9	133
R	48	134	2	184
F	77	84	16	177
Interruptions from		2		2
Interruptions to	2			2
Overlaps				14
Utterances	902	429	44	1375
Words	6528	1285	82	7895
MLU	7.57	3.2	1.88	12.65
Other Group TOTAL	66	43	11	120
NSSE	12	6	1	19
NACK	33	6	3	42
NCD	21	31	6	58
Nunintell	0	0	1	1
Provisions TOTAL	636	324	16	976
PI	448	253	14	715
PF	108	0	1	109
PP	4	0	1	5
Clarifications	43	23	0	66
PS	33	48	0	81
Requests TOTAL	200	62	17	279
Clarification	9	5	3	17
RI	117	57	13	187
ROA	53	0	1	54
RJA	21	0	0	21

F2F			
Therapist	3JM	Parent	TOTAL
356	354	14	724
42	18	2	62
2	6	0	8
164	53	6	223
44	124	0	168
104	153	6	263
1	4	0	5
4	1	0	5
			3
710	436	16	1162
5022	1004	38	6064
7.51	2.52	2.38	12.41
84	83	2	169
28	27	0	55
32	28	0	60
24	26	2	52
0	2	0	2
421	277	11	709
288	228	7	523
39	0	0	39
45	6	3	54
33	12	1	46
16	31	0	47
208	76	3	287
5	5	0	10
114	59	1	174
74	12	2	88
15	0	0	15

Session Type	Skype			F2F		
Speaker	Therapist	4SM	TOTAL	Therapist	4SM	TOTAL
Turns	229	229	458	261	261	522
I	41	32	73	19	52	71
R/I	6	6	12	22	8	30
F/I	95	33	128	146	84	230
R	29	88	117	14	34	48
F	58	70	128	60	83	143
Interruptions from	1	7	8	1	8	9
Interruptions to	7	1	8	8	1	9
Overlaps			8			3
Utterances	703	301	1004	808	388	1196
Words	6265	1135	7400	4574	1755	6329
MLU	9.35	3.9	13.25	6.28	4.75	11.03
Other Group TOTAL	122	65	187	139	52	191
NSSE	40	0	40	4	0	4
NACK	57	26	83	50	14	64
NCD	53	37	90	59	34	93
Nunintell	0	2	2	4	4	8
Provisions TOTAL	412	153	565	503	237	740
PI	267	123	390	373	202	575
PF	51	0	51	25	2	27
PP	32	0	32	3	1	4
Clarifications	38	15	53	30	7	37
PS	28	18	46	113	29	142
Requests TOTAL	169	83	252	166	99	265
Clarification	6	6	12	14	2	16
RI	84	37	121	37	13	50
ROA	55	39	94	110	84	194
RJA	24	1	25	5	0	5

Session Type	Skype			
Speaker	Therapist	5SM	LSA	TOTAL
Turns	186	186	0	372
I	8	28	0	36
R/I	11	4	0	15
F/I	95	8	0	103
R	17	92	0	109
F	55	54	0	109
Interruptions from	1	4	0	5
Interruptions to	4	1	0	5
Overlaps				12
Utterances	825	209	0	1034
Words	6415	866	0	7281
MLU	8.42	4.54	0	12.96
Other Group TOTAL	59	31	0	90
NSSE	10	1	0	11
NACK	35	9	0	44
NCD	14	20	0	34
Nunintell	0	1	0	1
Provisions TOTAL	618	144	0	762
PI	504	120	0	624
PF	26	0	0	26
PP	1	0	0	1
Clarifications	47	2	0	49
PS	40	22	0	62
Requests TOTAL	148	34	0	182
Clarification	10	3	0	13
RI	77	29	0	106
ROA	54	2	0	56
RJA	7	0	0	7

F2F			
Therapist	5SM	LSA	TOTAL
298	260	62	620
30	53	9	92
24	6	0	30
115	47	6	168
24	57	3	84
105	97	44	246
1	15	0	16
15	1	0	16
			13
883	301	84	1268
6006	1306	372	7684
7.4	4.6	4.61	16.61
150	77	18	245
37	1	3	41
41	15	0	56
72	54	14	140
0	7	1	8
507	133	51	691
380	103	45	528
43	0	2	45
4	0	0	4
31	8	3	42
49	23	1	73
226	91	15	332
7	2	0	9
80	49	5	134
114	40	10	164
25	0	0	25

Session Type	Skype				F2F			
Speaker	Therapist	6JF	Parent	TOTAL	Therapist	6JF	Parent	TOTAL
Turns	144	144	10	298	51	50		101
I	31	19	1	51	10	7		17
R/I	8	17		25	4	1		5
F/I	65	10		75	21	3		24
R	7	62	4	73	4	22		26
F	33	36	5	74	12	17		29
Interruptions from	5	11		16	0	0		0
Interruptions to	9	4	3	16	0	0		0
Overlaps				13	0	0		0
Utterances	551	193	11	755	305	64		369
Words	4040	390	75	4505	3012	165		3177
MLU	8.27	2.59	7.38		10.29	3.09		13.38
Other Group Total	78	34	3	106	48	9		57
NSSE	28	13	0	41	11	3		14
NACK	38	5	2	45	24	3		27
NCD	12	13	0	25	13	2		15
Nunintell	0	3	1	4	0	1		1
Providing Total	351	142	7	500	177	41		218
PI	212	89	4	305	109	24		133
PF	32	0	0	32	41	0		41
PP	42	0	0	42	14	0		14
Clarifications	22	0	0	84	10	0		10
PS	43	53	3	99	3	17		20
Requests Total	122	17	1	140	80	14	Not Present	94
Clarification	2	2	0	4	1	3		4
RI	59	5	1	65	35	11		46
ROA	29	9	0	38	29	0		29
RJA	32	1	0	33	15	0		15

Session Type	Skype				F2F			
Speaker	Therapist	7JM	Parent	TOTAL	Therapist	7JM	Parent	TOTAL
Turns	270	266	29	565	260	260		520
I	16	20	0	36	21	37		58
R/I	9	7	0	16	8	3		11
F/I	84	103	11	198	88	37		125
R	35	67	3	105	59	84		143
F	126	69	15	210	84	99		183
Interruptions from	5	5	0	10	1	9		10
Interruptions to	5	5	0	10	9	1		10
Overlaps				6			Not	13
Utterances	542	340	32	914	494	345	Present	839
Words	2547	956	98	3601	3112	1214		4326
MLU	4.97	3.03	3.06	11.06	6.46	3.88		10.34
Other Group TOTAL	125	66	12	203	48	50		98
NSSE	23	10	0	33	5	12		17
NACK	64	17	1	82	14	10		24
NCD	37	38	0	75	29	24		53
Nunintell	1	1	11	13	0	4		4
Provisions TOTAL	298	217	12	527	324	236		560
PI	188	180	5	373	275	204		479
PF	20	0	0	20	18	0		18
PP	11	0	5	16	7	0		7
Clarifications	70	12	2	84	13	3		16
PS	12	25	0	37	11	29		40
Requests TOTAL	119	57	7	183	122	59		181
Clarification	1	0	0	1	3	4		7
RI	64	43	3	110	93	47		140
ROA	25	6	3	34	21	7		28
RJA	29	8	1	38	5	1		6

Session Type	Skype			
Speaker	Therapist	8SM	Parent	TOTAL
Turns	138	100	69	307
I	9	6	5	20
R/I	3	3	0	6
F/I	75	29	6	110
R	1	32	5	38
F	50	30	53	133
Interruptions from				
Interruptions to				0
Overlaps				3
Utterances	379	128	93	600
Words	2388	392	575	3355
MLU	6.9	3.55	6.65	17.1
Other Group TOTAL	70	27	13	110
NSSE	19	8	5	32
NACK	33	4	1	38
NCD	18	9	6	33
Nunintell	0	6	1	7
Provisions TOTAL	250	95	74	419
PI	206	75	64	345
PF	14	0	0	14
PP	0	0	0	0
Clarifications	13	6	8	27
PS	17	14	2	33
Requests TOTAL	59	6	8	73
Clarification	5	1	0	6
RI	41	4	6	51
ROA	9	1	2	12
RJA	4	0	0	4

F2F			
Therapist	8SM	Parent	TOTAL
185	149	52	386
26	6	11	43
5	6	0	11
79	22	12	113
8	21	3	32
67	94	26	187
1	1	1	3
2	1	0	3
			2
645	236	77	958
4272	643	504	5419
7.06	3.34	7.04	17.44
77	76	15	168
24	30	6	60
34	20	1	55
19	22	8	49
0	4	0	4
459	143	46	648
350	110	42	502
48	0	3	51
7	0	1	8
31	7	0	38
23	26	0	49
109	17	16	142
6	4	0	10
33	3	14	50
50	7	2	59
20	3	0	23

Session Type	Skype				F2F			
Speaker	Therapist	9IM	Mum	TOTAL	Therapist	9IM	Mum	TOTAL
Turns	193	203	172	568	260	195	234	689
I	30	28	29	87	15	23	28	66
R/I	1	0	0	1	9	4	5	18
F/I	78	8	77	163	92	15	111	218
R	16	77	8	101	22	85	6	113
F	68	90	58	216	122	68	84	274
Interruptions from	0	16	1	17	0	0	1	1
Interruptions to	15	0	2	17	1	0	0	1
Overlaps				8				9
Utterances	427	237	254	918	505	205	373	1083
Words	2269	605	1281	4155	2299	461	1961	4721
MLU	5.56	2.45	5.08	13.09	4.68	2.29	5.29	12.26
Other Group TOTAL	83	19	35	137	94	34	28	156
NSSE	17	4	2	23	3	0	2	5
NACK	19	1	4	24	33	0	3	36
NCD	47	6	29	82	58	21	22	101
Nunintell	0	8	0	8	0	13	1	14
Provisions TOTAL	262	203	126	591	291	142	193	626
PI	173	160	50	383	244	133	138	515
PF	17	0	4	21	13	0	1	14
PP	18	0	40	58	5	0	31	36
Clarifications	43	39	32	114	14	6	23	43
PS	11	4	0	15	15	3	0	18
Requests TOTAL	82	15	93	190	120	29	152	301
Clarification	3	0	5	8	9	0	2	11
RI	42	7	45	94	51	25	64	140
ROA	19	8	41	68	58	3	82	143
RJA	18	0	3	21	2	1	4	7

Session Type	Skype				F2F			
Speaker	Therapist	10JF	Parent	TOTAL	Therapist	10JF	Parent	TOTAL
Turns	111	102	12	225	318	307	26	651
I	8	4	0	12	1	15	2	18
R/I	2	1	0	3	33	26	1	60
F/I	74	4	6	84	176	68	7	251
R	6	68	1	75	29	97	0	126
F	21	25	5	51	79	101	16	196
Interruptions from	1	1	0	2	0	18	0	18
Interruptions to	1	1	0	2	18	0	0	18
Overlaps				7				8
Utterances	410	129	19	558	880	424	41	1345
Words	2811	306	37	3154	4992	1107	226	6325
MLU	7.25	2.61	1.94	11.8	6.22	2.89	5.51	14.62
Other Group TOTAL	40	38	3	81	122	107	6	235
NSSE	15	3	0	18	34	36	0	70
NACK	18	12	1	31	58	9	3	70
NCD	7	23	2	32	28	52	2	82
Nunintell	0	0	0	0	2	10	1	13
Provisions TOTAL*	250	74	12	336	554	207	28	789
PI	135	53	1	189	449	164	26	639
PF	50	0	0	50	17	0	1	18
PP	18	0	7	25	1	0	0	1
Clarifications	36	5	3	44	25	14	1	40
PS	11	16	1	28	62	29	0	91
Requests TOTAL	120	17	4	141	204	110	7	321
Clarification	12	3	2	17	8	6	0	14
RI	46	11	2	59	118	59	4	181
ROA	45	2	0	47	70	45	2	117
RJA	17	1	0	18	8	0	1	9

Session Type	Skype				F2F			
Speaker	Therapist	11SF	Parent	TOTAL	Therapist	11SF	Parent	TOTAL
Turns	119	119	not present	238	214	211	2	427
I	8	5		13	49	16	1	66
R/I	12	21		33	9	12	0	21
F/I	62	5		67	64	25	0	89
R	12	34		46	26	33	0	59
F	25	53		78	66	125	1	192
Interruptions from		7			2	7	0	9
Interruptions to	7			7	7	2	0	9
Overlaps				7				3
Utterances	424	151		575	547	312	2	861
Words	4321	468		4789	3661	846	20	4527
MLU	10.87	3.5		14.37	7.24	3.13	10	20.37
Other Group TOTAL	37	59		96	69	103	0	172
NSSE	10	6		16	11	15	0	26
NACK	13	29		42	22	45	0	67
NCD	14	16		30	36	43	0	79
Nunintell	0	8		8	0	0	0	0
Provisions TOTAL	332	68		400	411	183	0	594
PI	278	40		318	250	124	0	374
PF	24	0		24	35	3	0	38
PP	4	0		4	67	0	0	67
Clarifications	7	7		14	19	8	0	27
PS	19	21		40	40	48	0	88
Requests	55	24		79	67	26	2	95
Clarification	5	2		7	2	0	0	2
RI	39	21		60	13	19	1	33
ROA	8	1		9	35	2	1	38
RJA	3	0		3	17	5	0	22

Appendix 27: Main Study Discourse Total Number Count and Means

Format	Skype							F2F					
	Total	Mean	Total	Mean	Total	Mean		Total	Mean	Total	Mean	Total	Mean
Speaker and Number	Therapist = 11		Child = 11		Parent = 7			Therapist = 11		Child = 11		Parent = 5	
Turns	2305	209.55	2250	204.55	516	73.71		2802	254.73	2642	240.18	388	77.6
I	221	20.09	230	20.91	55	7.86		232	21.09	288	26.18	52	10.4
R/I	75	6.82	74	6.73	1	0.14		218	19.82	90	8.18	6	1.2
F/I	1128	102.55	303	27.55	167	23.86		1245	113.18	447	40.64	142	28.4
R	210	19.09	947	86.09	34	4.86		277	25.18	710	64.55	12	2.4
F	671	61.00	696	63.27	259	37.00		864	78.55	1108	100.73	259	51.8
Utterances	6453	586.64	2617	237.91	671	95.86		6803	618.45	3070	279.09	579	115.8
Words	49497	4499.73	8655	786.82	2932	418.86		46043	4185.73	11086	1007.82	3094	618.8
MLU	7.5		3.0		4.2			6.7		3.2		6.4	
Other Group TOTAL	959	87.18	621	56.45	130	18.57		964	87.64	798	72.55	69	13.8
NSSE	201	18.27	69	6.27	13	1.86		203	18.45	166	15.09	11	2.2
NACK	419	38.09	135	12.27	12	1.71		368	33.45	184	16.73	7	1.4
NCD	338	30.73	333	30.27	79	11.29		467	42.45	365	33.18	48	9.6
Nunintell	1	0.09	84	7.64	16	2.29		6	0.55	61	5.55	3	0.6
Provisions TOTAL	4476	406.91	1999	181.73	366	52.29		4591	417.36	2034	184.91	329	65.8
PI	3131	284.64	1598	145.27	165	23.57		3384	307.64	1598	145.27	258	51.6
PF	408	37.09	1	0.09	8	1.14		363	33.00	7	0.64	7	1.4
PP	181	16.45	0	0.00	115	16.43		210	19.09	8	0.73	35	7
Clarifications	581	52.82	159	14.45	71	10.14		277	25.18	196	17.82	28	5.6
PS	280	25.45	311	28.27	6	0.86		357	32.45	303	27.55	1	0.2
Requests TOTAL	1499	136.27	451	41.00	195	27.86		1757	159.73	707	64.27	193	38.6
Clarifications	87	7.91	44	4.00	15	2.14		118	10.73	33	3.00	2	0.4
RI	860	78.18	316	28.73	87	12.43		749	68.09	375	34.09	88	17.6
ROA	344	31.27	81	7.36	81	11.57		694	63.09	278	25.27	98	19.6
RJA	208	18.91	13	1.018	13	1.86		166	15.09	21	1.91	5	1

Appendix 28: Number Count from Both Session Formats for 9IM and 10JF

	Skype			F2F		
Interaction Aspect	Therapist	9IM	Adult	Therapist	9IM	Adult
Turns	193	203	172	260	195	234
Utterances	427	237	254	505	205	373
Mean Length	5.56	2.45	5.08	4.68	2.29	5.29
I	30	28	29	15	23	28
R/I	1	0	0	9	4	5
F/I	78	8	77	92	15	111
R	16	77	8	22	85	6
F	68	90	58	122	68	84
Other Group	83	19	35	94	34	28
Providing	262	203	126	291	142	193
Request	82	15	93	120	29	152
RI	42	7	45	51	25	64
ROA	19	8	41	58	3	82
RJA	18	0	3	2	1	4
Clarifications	3	0	5	9	0	2
PI	173	160	50	244	133	138
PF	17	0	4	13	0	1
PP	18	0	40	5	0	31
Clarifications	43	39	32	14	6	23
PS	11	4	0	15	3	0
NSSE	17	4	2	3	0	2
NACK	19	1	4	33	0	3
NCD	47	6	29	58	21	22
Interruptions from	0	16	1	0	0	1
Interruptions to	15	0	2	1	0	0
Overlaps	8			9		

Interaction Aspect	Therapist	10JF	Adult	Therapist	10JF	Adult
Turns	111	102	12	318	307	26
Utterances	410	129	19	880	424	41
Mean Length	7.25	2.61	1.94	6.22	2.89	5.51
I	8	4	0	1	15	2
R/I	2	1	0	33	26	1
F/I	74	4	6	176	68	7
R	6	68	1	29	97	0
F	21	25	5	79	101	16
Neither Group	40	38	3	122	107	6
Providing	250	74	12	554	207	28
Request	120	17	4	204	110	7
RI	46	11	2	118	59	4
ROA	45	2	0	70	45	2
RJA	17	1	0	8	0	1
Clarifications	12	3	2	8	6	0
PI	135	53	1	449	164	26
PF	50	0	0	17	0	1
PP	18	0	7	1	0	0
Clarifications	36	5	3	25	14	1
PS	11	16	1	62	29	0
NSSE	15	3	0	34	36	0
NACK	18	12	1	58	9	3
NCD	7	23	2	28	52	2
Interruption from	1	1	0	0	18	0
Interruptions to	1	1	0	18	0	0
Overlaps	7			8		

Appendix 29: Number Count for Cluedo in Both Session Formats for 8SM and 10JF

	Skype			F2F		
Interaction Aspect	Therapist	8SM	Adult	Therapist	8SM	Adult
Turns	29	27	8	63	59	17
Utterances	86	38	10	207	82	26
I	1	4	2	12	5	5
R/I	2	3	0	4	6	0
F/I	15	1	0	17	12	1
R	0	11	0	7	9	0
F	11	8	6	23	48	11
Other Group	19	8	1	30	22	2
Providing	52	24	6	138	48	19
Request	15	6	3	39	12	5
RI	11	5	1	12	2	4
ROA	4	1	2	16	4	1
RJA	0	0	0	7	4	0
Clarifications	0	0	0	4	2	0
PI	41	19	5	103	36	18
PF	2	0	0	14	0	1
PP	0	0	0	3	0	0
Clarifications	7	0	0	16	2	0
PS	2	5	1	2	10	0
NSSE	1	1	0	1	2	1
NACK	13	2	0	19	11	0
NCD	5	5	1	10	8	1
Interruptions from	N/A	N/A	N/A	N/A	N/A	N/A
Interruptions to	N/A	N/A	N/A	N/A	N/A	N/A
Overlaps	0			0		
Interaction Aspect	Therapist	10JF	Adult	Therapist	10JF	Adult
Turns	26	26	0	97	87	15
Utterances	84	46	0	303	132	30
I	3	3	0	0	7	2
R/I	0	1	0	3	2	1
F/I	13	2	0	53	13	5
R	2	14	0	9	27	0
F	8	6	0	32	38	7
Other Group	6	13	0	37	30	4
Providing	48	19	0	226	92	21
Request	30	14	0	40	10	5
RI	12	11	0	20	0	2
ROA	8	2	0	17	6	2
RJA	4	0	0	2	0	1
Clarifications	6	1	0	1	4	0
PI	33	10	0	192	67	20
PF	7	0	0	2	0	0
PP	0	0	0	1	0	0
Clarifications	8	0	0	12	1	1
PS	0	9	0	19	24	0
NSSE	1	1	0	8	7	0
NACK	5	5	0	22	3	2
NCD	0	7	0	5	13	1
Interruptions from	N/A	N/A	N/A		5	
Interruptions to	N/A	N/A	N/A	5		
Overlaps	1			5		

Appendix 30: Number Count for Picdoku Activity in Both Session Formats for 4SM

Interaction Aspect	Skype		F2F	
	Therapist	4SM	Therapist	4SM
Turns	22	21	13	12
Utterances	69	45	47	14
I	0	1	0	1
R/I	0	0	1	0
F/I	8	3	6	2
R	0	1	1	6
F	14	6	5	3
Other Group Utterances	16	2	4	2
NSSE	1	0	0	0
NACK	14	1	3	0
NCD	1	1	1	2
Providing Utterances	48	7	35	10
PI	28	1	17	10
PF	15	0	8	0
PP	0	0	0	0
Clarifications	3	1	5	0
PS	2	5	5	0
Request Utterances	5	36	8	2
RI	0	0	0	2
ROA	4	36	7	0
RJA	1	0	0	0
Clarifications	0	0	7	0
Interruptions	None	None	None	None
Overlaps	1		0	

Appendix 31: Turn Number Count for Activities used in Both Session Formats

Activity		Skype			F2F		
		Therapist	Participant	Adult	Therapist	Participant	Adult
2JM	Numberchase	70	63	17	52	51	Not present
		Total Turns		150	Total Turns		103
2JM	Goblet Kid	19	14	6	29	28	Not present
		Total Turns		39	Total Turns		57
3JM	Goblet Kid	18	17	5	30	15	0
		Total Turns		40	Total Turns		45
3JM	Cranium Conga	90	89	3	114	112	14
		Total Turns		182	Total Turns		240
4SM	Picdoku	22	21	Not present	13	12	Not present
		Total Turns		43	Total Turns		25
5SM	Mastermind	37	36	0	25	22	2
		Total Turns		73	Total Turns		49
6JF	Mastermind	43	42	0	14	13	Not present
		Total Turns		85	Total Turns		27
6JF	Alert Listening	33	36	6	6	5	Not present
		Total Turns		75	Total Turns		11
7JM	Connect 4	21	20	2	57	56	Not present
		Total Turns		43	Total Turns		113
8SM	Cluedo	29	27	8	63	59	17
		Total Turns		64	Total Turns		139
9IM	Quack Quack	126	148	82	116	83	94
		Total Turns		356	Total Turns		293
9IM	Guess Who?	21	29	36	90	85	92
		Total Turns		86	Total Turns		267
10JF	Cluedo	26	26	0	97	87	15
		Total Turns		52	Total Turns		199
11SF	Hop to it	31	30	Not present	50	50	Not present
		Total Turns		61	Total Turns		100
11SF	Word Blind	40	39	Not present	88	87	Not present
		Total Turns		79	Total Turns		175

Appendix 32: Goals Achieved and Activities Completed in the 60 Minute Skype and F2F Speech and Language Therapy Sessions

Session Number		1	2	3	4	5	6	7	8	9	Mean
1JF	Skype Goals	60%	60%	70%	70%	70%					66%
	Activities	6	6	7	5	4					5.6
	F2F Goals	60%	50%	60%	70%	70%					62%
	Activities	5	5	5	5	6					5.2
2JM	Skype Goals	78%	89%	78%	66%	78%	78%	78%	56%		78%
	Activities	5	5	6	6	7	6	7	6		6.0
	F2F Goals	78%	66%								67%
	Activities	7	5								6.0
3JM	Skype Goals	66%	89%	56%	56%	78%					78%
	Activities	6	6	6	5	6					5.8
	F2F Goals	78%	66%	44%	44%	33%					53%
	Activities	5	6	4	5	3					4.6
4SM	Skype Goals	100%	80%	80%	80%	80%	80%	80%	80%		83%
	Activities	7	4	5	4	4	6	4	3		4.6
	F2F Goals	100%	50%								75%
	Activities	5	1								3.0
5SM	Skype Goals	63%	63%	88%	75%	63%					70%
	Activities	5	5	6	5	6					5.4
	F2F Goals	57%	50%	50%	75%	63%					60%
	Activities	5	4	5	5	5					4.8

Appendix 32: Goals Achieved and Activities Completed in the 30 Minute Skype and F2F Speech and Language Therapy Sessions

Session Number		1	2	3	4	5	6	7	8	9	Mean
6JF	Skype Goals	71%	57%	100%	57%	57%	71%	86%	86%		73%
	Activities	4	3	4	3	3	3	3	3		3.25
	F2F Goals	57%	57%								57%
	Activities	3	3								3.00
7JM	Skype Goals	66%	66%	66%	66%	50%	66%				63%
	Activities	5	4	4	5	3	3				4.00
	F2F Goals	50%	83%	50%	50%						58%
	Activities	3	4	3	3						3.25
8SM	Skype Goals	57%	50%	50%	75%	50%	63%	56%	50%	57%	56%
	Activities	3	3	2	4	2	2	3	3	3	2.78
	F2F Goals	25%									25%
	Activities	3									3.00
9IM	Skype Goals	63%	63%	63%	88%	75%	63%	75%			70%
	Activities	3	3	3	3	3	3	4			3.14
	F2F Goals	33%	33%	63%							43%
	Activities	3	2	3							2.67
10JF	Skype Goals	88%	88%	63%	75%	75%	88%	63%	88%		79%
	Activities	3	4	3	3	3	4	2	3		3.13
	F2F Goals	63%	75%								69%
	Activities	4	3								3.5
11SF	Skype Goals	80%	60%	80%	80%	80%	80%	80%	80%	80%	78%
	Activities	3	3	3	3	3	3	3	3	3	3.0
	F2F Goals	80%									80%
	Activities	3									3.0