Abstract

Background:
MyChoicePad is an educational application (app) for the iPad that uses Makaton symbols and signing to enable choice and communication for people with learning or communication difficulties; it supports communication at a key word level. The app was not designed to be used purely as a communication aid but to support a Makaton user and their communication partner. Some early case studies with adults with learning disability suggested that MyChoicePad can also increase a user’s confidence in communicating and help to develop listening and attention skills.

Aims:
This study investigated the effectiveness of using MyChoicePad as a communication and learning tool in a specialist college in the UK.

The main question being asked was:

- Does MyChoicePad support expressive language in young adults with learning disability?

This led to three further, more specific, questions:

1. Does MyChoicePad support young adults with learning disability to answer questions about themselves?
2. Does MyChoicePad increase utterance length in young adults with learning disability?
3. Does using MyChoicePad have an effect on young adults with learning disability’s confidence and social language skills?

Methods & Procedures:
8 participants were selected that had similar receptive language skills. Results from their baseline assessment indicated that they all understood language at a 3-4 Information Carrying Word (ICW) level. Their expressive language levels varied but they all had significant communication needs.

To address the first research question, the participants were asked a series of basic questions and their responses were recorded on a ‘Flip’ video camera. All participants then had a period (a minimum of 8 x 1 hour long group sessions) of recommended speech and language therapy. Group A (6 participants) received specific MyChoicePad therapy (recommended from their baseline assessment) and Group B (2 controls) received either fluency or language therapy (also recommended following their baseline assessment). At the end of that period of input the participants were asked the same set of
questions and again the results were recorded in the same way. In both sessions where they were asked questions, participants could use their chosen Alternative and Augmentative Communication (AAC) system. The samples were analysed by an untrained listener to reduce any bias. The results were analysed by mean percentage of questions answered appropriately, intelligibly and meaningfully as well as by mean length of utterance to help to answer the second research question.

In order to answer the third question a series of questionnaires were sent out prior to any therapeutic intervention. These were sent out to the main carers of all the participants to gain insight into the participants’ current communication skills. Post-intervention the carers were asked to give verbal feedback regarding any perceived changes in participants’ communication skills. Furthermore, observations of body language and willingness to communicate were made during video one and two.

**Outcomes & results:**

The results of this small study suggest that the use of MyChoicePad does support expressive language in young adults with learning disability and the results were positive in answering all three research questions. Statistical data generated supported the research hypotheses and qualitative data gave additional information to support the questions being asked. There are however, limitations to this small scale study; these are discussed further in the main body of the study.

**Implications:**
The study found that MyChoicePad supported the learner’s expressive language skills and helped them answer questions about themselves, thus gaining functional communication skills. The learner’s gained in confidence and social language skills whilst using MyChoicePad, however, these were not generalised to other settings. There is a wealth of research to support the use of Makaton signing and symbols, but limited research into the outcomes of using communication applications. This study suggests that accessing signing and symbols using low cost technology and MyChoicePad is beneficial to the user as well as practitioners working in this setting.
Introduction

Communicative competence is “the ability to communicate functionally in the natural environment and to adequately meet daily communication needs” (Janice Light, 1989) i.e. to be able to communicate everyday needs effectively. Having worked as a speech and language therapist in a specialist college it is evident that not all young adults with learning disability have the skills to do this and so require a system to support their communication. AAC systems can be high tech and very expensive, for example an eye gaze voice output communication aid or low (or even no) tech, for example a communication book.

All the participants in the study had used Makaton signing or symbols in the past and had shown interest in MyChoicePad during the baseline assessment. In general practice, the speech and language therapist at the college uses MyChoicePad to assess knowledge of signing and symbols as part of the initial assessment process. The researcher wanted to investigate the effectiveness of MyChoicePad in developing functional communication and expressing everyday needs.

There is a wealth of research to support the use of Makaton signing and symbols with adults and children with communication and learning difficulties but because MyChoicePad is a relatively new application there has been little research into its effectiveness.

Tablets and iPads are becoming increasingly popular in today’s society and being used more frequently in educational establishments. At present there is limited published research into using iPads. One study (Heinreich, 2012) found that the implementation of iPads has had a positive effect on learning; students are more motivated if using iPads, everyone involved in the study found them easy to use, the study also found that the use of iPads was cost effective. However, some people have their reservations, for example Mike Silagadze (http://betanews.com/2012/10/24/5-problems-with-ipads-in-education/) quoted a study of four Californian school districts which found that the learners did not perform any better than their controls. There is currently even less published research into using tablets in special education. David Graham Farnsworth (http://www.brighthubeducation.com/special-ed-inclusion-strategies/123140-using-the-ipad-for-learners-with-special-needs/) discusses the benefits of using iPads in special education, in particular for the use with people on the Autistic Spectrum.

In addition to their use in education, a range of communication apps are now on the market as communication grid software has developed. There are
MyChoicePad Study: Adults with Learning Disability

limitations to using tablets as communication devices; they are generally touch screen or keyboard access which causes access issues and the volume is limited. However, for a range of users including young adults, teenagers and children, iPads can be appealing because they are mainstream devices and are perhaps more inconspicuous than traditional communication aids (http://speechbubble.org.uk/device/ipad/). The significant differences in costs between voice output communication aids and tablets also has implications; as communication devices iPads are a cost efficient alternative.

MyChoicePad has been used across many different settings from early years to adults. Some case studies have been carried out by practitioners working with people with a range of communication needs. The app has been found to be effective in learning new vocabulary, increasing means of expression, teaching Makaton signing and symbols, conversational skills, listening and attention and confidence in communicating, and as importantly, the majority of users have found it enjoyable and fun to use. There have been numerous studies into positive emotions and the impact on learning (Christianson, 1992; Andreasen et al, 1999; Kohn, 2004) so enjoyable, fun learning is not a factor that should be dismissed when considering learning materials.

A social impact survey was carried out by Insane Logic in 2012 (http://www.mychoicepad.com/news-events/mychoicepad-s-social-impact/) which found that almost 90% of speech, language and communication professionals said that MyChoicePad saved time in their practice, the majority of Makaton tutors saw an improvement in the users’ communication skills, 1 in 2 care professionals found that users engaged more whilst using MyChoicePad and almost 70% of users said that they had developed independence skills.
MyChoicePad Study: Adults with Learning Disability

Methodology

Research questions:

1. Does MyChoicePad support young adults with learning disability to answer questions about themselves?

Research Hypothesis 1:
This is looking at the percentage difference in number of questions answered with verbal expression alone and then with MyChoicePad to support expression.

The percentage difference (progress made) will be greater in Group A than Group B

2. Does MyChoicePad increase utterance length in young adults with learning disability?

Research Hypothesis 2:
This is looking at the difference in mean utterance length when using verbal expression alone and when using MyChoicePad to support expression.

The score difference (progress made) will be greater in Group A than Group B

3. Does using MyChoicePad have an effect on young adults with learning disability’s confidence and social language skills?

This is looking at any perceived differences in functional communication skills, confidence and social language skills following a period of intervention. The information gathered and results were qualitative and therefore statistical analysis was not applied and no research hypothesis generated.
**Research Design:**

The research design was descriptive research comparing one population to their controls. The aim of descriptive research is to generalise the results beyond the limits of the study thus achieving high external validity. This is important for clinicians and/or practitioners using MyChoicePad in other settings. Descriptive research can be more analytical than purely qualitative research but has less control than true experimental research. The data generated from this study is both quantitative and qualitative; research questions one and two have generated *quantitative* data and research question three has generated *qualitative* data. Therefore, some statistical analysis can be applied.

**Population:**

Male and female adults with learning disability aged between 19 and 20 years. All participants understand language at a 3-4 ICW level. All participants have been diagnosed as having severe learning disability (SLD).

**Group A:**
Participant group comprised of four male and two female learners.

**Group B:**
Control group comprised of one male and one female learner.

**Research Sample:**

The sampling methods used were purposive sampling and convenience sampling. Purposive sampling is used when working with a smaller sample size and when samples want to fit into specific characteristics. Purposive sampling can be useful when wanting to study particular groups of people i.e. young adults with learning disability with the same level of receptive language. However there is a chance that when selecting the sample subconsciously bias might occur.

Convenience sampling also had to be deployed, i.e. the researcher used those learners that were available for therapeutic input.

The research group and control group were not matched for number of participants, but gender and age were matched as far as possible.
Table 1: Study sample

<table>
<thead>
<tr>
<th>Participant No.</th>
<th>Age</th>
<th>Gender</th>
<th>Disability</th>
<th>Receptive Language</th>
<th>Expressive Language/communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19y</td>
<td>male</td>
<td>SLD</td>
<td>3-4 ICW</td>
<td>Expressive language delay</td>
</tr>
<tr>
<td>2</td>
<td>19y</td>
<td>male</td>
<td>SLD Down syndrome Hearing Impairment</td>
<td>3-4 ICW</td>
<td>Language delay, unintelligible speech</td>
</tr>
<tr>
<td>3</td>
<td>20y</td>
<td>female</td>
<td>SLD</td>
<td>3-4 ICW</td>
<td>Phonological and expressive language delay</td>
</tr>
<tr>
<td>4</td>
<td>19y</td>
<td>male</td>
<td>SLD ASD</td>
<td>3-4 ICW</td>
<td>Frequent echolalia, expressive language delay</td>
</tr>
<tr>
<td>5</td>
<td>19y</td>
<td>male</td>
<td>SLD Down syndrome Hearing Impairment</td>
<td>3-4 ICW</td>
<td>Significant dysfluency</td>
</tr>
<tr>
<td>6</td>
<td>19y</td>
<td>female</td>
<td>SLD</td>
<td>3-4 ICW</td>
<td>Phonological delay, articulation difficulties</td>
</tr>
<tr>
<td>C1</td>
<td>19y</td>
<td>male</td>
<td>Down syndrome Hearing Impairment</td>
<td>3-4 ICW</td>
<td>Significant dysfluency</td>
</tr>
<tr>
<td>C2</td>
<td>20y</td>
<td>female</td>
<td>SLD</td>
<td>3-4 ICW</td>
<td>Expressive language delay</td>
</tr>
</tbody>
</table>

Variables:

Independent Variable (IV):
For both research questions the independent variable is the use of MyChoicePad. Participants in Group A used MyChoicePad as a support to answering questions. Participants in Group B did not use MyChoicePad to answer questions.

Dependent Variable (DV):
The dependent variable for question one is the ability to answer questions. This is the percentage of questions answered appropriately, intelligibly and meaningfully out of a series of questions. The dependent variable for question two is utterance length. This is the number of elements expressed either verbally or by using chosen AAC systems including MyChoicePad.

Extraneous Variables:
Extraneous variables can be described as any variable other than independent variable that may affect the dependent variable.
The three main threats to external validity are: **people**, **places** and **times**. If these are not controlled for it could affect the extent to which the research can be generalised.

**Procedure:**

- Baseline assessments were carried out to identify learners that were at a similar level of understanding and that had considerable expressive difficulties (see Table 1).
- Recommendations from the baseline assessments as to appropriate therapy group were followed.
- Consent forms were completed.
- Questionnaires were sent out to the main carers of the participants; this was the head of residence for the residential learners and parents for day learners that were involved in the study.
- Series of questions were asked to each participant:
  
  1. What is your name?
  2. Where do you live?
  3. Who lives at home?
  4. Do you have any pets?
  5. What are their names? (if the answer to question 4 was “yes”)
  6. What things do you like doing?
  7. What is your favourite TV programme?
  8. What is your favourite music?
  9. What is your favourite food?
  10. Where do you work in college?
  11. Who is your personal tutor?
  12. Who is your best friend?

  Participants could use their chosen AAC system to answer these questions. However, none of the participants had any systems in place at the time that the first set of questions were asked. The results were recorded on video to analyse at a later date by an untrained listener (i.e. an independent person that does not work with people with communication needs or learning disabilities).

- Each participant received a minimum of 8 x hour long therapy sessions. The aim was for 9 therapy sessions; however, some sessions were missed due to illness or educational reasons. One participant from Group B had some additional individual sessions in using ‘Text Talker’ a text-to-speech app for the iPad.
Therapy

Group A:
All participants from Group A received therapy in a specific MyChoicePad group; a multimodal approach to communication and learning, using speech, signing, symbols, pictures and MyChoicePad to develop functional communication skills and social language skills. This group provided a platform to gather and elicit information in order to build grids for the learners to answer the questions appropriately.

Group B:
C1 received therapy in a fluency group; a joint group working with physiotherapists to develop breath support, speech sounds, signing skills and ultimately confident communication skills.
C2 received therapy in a language group; a small group working on developing receptive and expressive language skills, confident and appropriate communication supported by signing and symbols.

- At the end of the period of therapy the participants were all asked the same series of questions. It became apparent that some of the participants that were using MyChoicePad were answering the questions by rote and in the order that the grids had been made up. Therefore, to try to maximise reliability, the questions were asked again but in a different order. One participant from Group B used a communication app on the iPad called Text Talker on Gridplayer. The results were recorded on video to be analysed at a later date.
- Results were analysed for percentage of questions answered, mean utterance length and body language of participants.
- Questionnaires were returned and analysed.
- Verbal feedback was gained from the participants’ main caregivers.

Ethical Considerations:

A number of measures were taken to ensure the study was as ethical as possible.

Confidentiality: All information gathered was confidential. No names or initials were used in the study. The independent, untrained listener signed a confidentiality form.
Consent: Informed consent was gained from all participants; this was written in symbol format and simplified to be at an appropriate language level.
Right to withdraw: The right to withdraw was discussed with all participants using sign if necessary.
Physical or psychological harm: It was not expected that the participants would come to any harm during the course of this study; all participants
attended therapy groups and had the same input as they would have received without a study being conducted. However, there was a chance that they may have felt anxious whilst answering questions and being videoed. Reassurance was given before and after each video to reduce anxiety levels.
Results

Research questions:

1. Does MyChoicePad support young adults with learning disability to answer questions about themselves?

Research Hypothesis 1:
This is looking at the percentage difference in number of questions answered with verbal expression alone and then with MyChoicePad to support expression.

The percentage difference (progress made) will be greater in Group A than Group B

2. Does MyChoicePad increase utterance length in young adults with learning disability?

Research Hypothesis 2:
This is looking at the difference in mean utterance length when using verbal expression alone and when using MyChoicePad to support expression.

The score difference (progress made) will be greater in Group A than Group B

3. Does using MyChoicePad have an effect on young adults with learning disability’s confidence and social language skills?

This is looking at any perceived differences in social language skills. The information gathered and results are qualitative and therefore statistical analysis was not applied and therefore no research hypothesis generated.

Statistical analysis can be applied to questions one and two and this will determine whether there are differences in the scores of Group A and Group B and therefore, whether the hypotheses can be accepted.
**Question 1**

This is looking at the percentage difference in number of questions answered with verbal expression alone and then with MyChoicePad to support expression. The answers to the questions had to be intelligible to an untrained listener, be an appropriate answer to the question asked and to be meaningful i.e. not a repetition of the administrator’s expression, a forced alternative or a “yes” or “no” answer that did not give meaning or information. The data was given as a percentage because not all participants answered the same number of questions depending on whether they had answered “yes” to question 4.

Chart 1:
Chart 2: This shows the difference between score 1, which is the data from the initial questions, and score 2, which is the data from the questions asked post-intervention.

These charts show that both groups made significant progress after a period of therapy in being able to answer questions about themselves. Group A had scored lower than Group B initially. However, there is a difference in the scores; Group A does have a greater percentage difference than Group B and they have therefore made greater progress in being able to answer questions about themselves.

**Question 2**

This is looking at the difference in mean utterance length when using verbal expression alone and when using MyChoicePad to support expression. The results were analysed by the number of elements of meaning or concepts a participant used in expressing themselves rather than words alone. This is because some cells in the grids of MyChoicePad contain more than one word. The following charts display the average utterance length both pre and post-intervention and the differences between Group A and Group B.
Chart 3:

This shows the difference between score 3, which is the data from the initial questions, and score 4, which is the data from the questions asked post-intervention.

Chart 4:

This shows the difference between score 3, which is the data from the initial questions, and score 4, which is the data from the questions asked post-intervention.

In Chart 4, it can clearly be seen that there is a significant difference between scores in Group A and Group B; this is an increase in the average amount of elements used in expressing themselves.

For Hypothesis 1 to be accepted the percentage difference (progress made from starting point to end point) needed to be greater in Group A than Group
B; the percentage difference in Group A was 62% whereas in Group B it was 50%. Therefore, Hypothesis 1 can be accepted.

For Hypothesis 2 to be accepted the score difference (progress made from starting point to end point) needed to be greater in Group A than Group B. the score difference in Group A was 2.7 and in Group B it was 0.4. Therefore, Hypothesis 2 can also be accepted.

**Question 3:**

This is looking at any perceived changes in social language and functional communication skills pre and post-intervention. Prior to any intervention, questionnaires regarding perceived communication skills were sent out to the participants’ main care givers. However, the number of questionnaires returned was lower than expected (62.5%) so it was difficult to analyse the data in a meaningful way. Some qualitative data was generated. In addition observations of body language (eye contact, facial expression and proximity) to indicate changes in confidence and willingness to communicate were made during both sets of videos.

At the end of the intervention period verbal feedback was given by only 50% of the main care givers so again it was difficult to gain any meaningful qualitative data.

**Table 2: Questionnaire results**

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes</th>
<th>Sometimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you understand him/ her?</td>
<td>2/5</td>
<td>3/5</td>
<td></td>
</tr>
<tr>
<td>Can strangers understand him/ her?</td>
<td>2/5</td>
<td>3/5</td>
<td></td>
</tr>
<tr>
<td>Does he/ she ever start conversations with you?</td>
<td>1/5</td>
<td>1/5</td>
<td>3/5</td>
</tr>
<tr>
<td>Does he/ she ask questions?</td>
<td>4/5</td>
<td>1/5</td>
<td></td>
</tr>
<tr>
<td>Can he/ she answer questions effectively?</td>
<td>3/5</td>
<td>2/5</td>
<td></td>
</tr>
<tr>
<td>Can he/ she tell you how he/ she is feeling?</td>
<td>3/5</td>
<td>2/5</td>
<td></td>
</tr>
<tr>
<td>Does he/ she make choices verbally?</td>
<td>1/5</td>
<td>4/5</td>
<td></td>
</tr>
<tr>
<td>Does he/ she interact with his/ her peers?</td>
<td>1/5</td>
<td>3/5</td>
<td>1/5</td>
</tr>
<tr>
<td>Have you observed him/ her starting a conversation with another student?</td>
<td>3/5</td>
<td>2/5</td>
<td></td>
</tr>
<tr>
<td>Does he/ she understand instructions?</td>
<td>2/5</td>
<td>3/5</td>
<td></td>
</tr>
<tr>
<td>Does he/ she demonstrate awareness of communication skills/ difficulties?</td>
<td>3/5</td>
<td>2/5</td>
<td></td>
</tr>
<tr>
<td>Do you think his/ her communication impacts on his/ her well-being?</td>
<td>2/5</td>
<td>1/5</td>
<td>1/5</td>
</tr>
</tbody>
</table>
**Verbal feedback:**

Three main topics were discussed in the conversations with carers following intervention; functional communication, communicative confidence and interaction with others. The question asked was:

“Have you noticed any changes to the participant’s 1) communication skills 2) confidence and 3) interaction skills?”

3 out of the 4 caregivers said that they had noted little change in communication skills but all said that the participants were more confident. One care giver felt that the participant had interacted with peers more and begun to initiate communication.

Table 3: Observations of body language

<table>
<thead>
<tr>
<th>Participant</th>
<th>Group</th>
<th>V1 observations</th>
<th>V2 observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 A</td>
<td></td>
<td>Maintained appropriate eye contact, smiled frequently, no signs of anxiety</td>
<td>Gained eye contact when appropriate, no signs of anxiety</td>
</tr>
<tr>
<td>2 A</td>
<td></td>
<td>Very limited eye contact, a little more towards the end of the video, frustrated facial expression seen frequently e.g. face screwed up</td>
<td>Gained eye contact occasionally, frequently smiled, focused, positive gestures observed e.g. thumbs up, no signs of frustration/ anxiety</td>
</tr>
<tr>
<td>3 A</td>
<td></td>
<td>Fleeting eye contact with the interviewer; tended to look at the camera, smiled frequently, little sign of anxiety</td>
<td>Fleeting eye contact; tended to look at the app, smiled frequently, little sign of anxiety</td>
</tr>
<tr>
<td>4 A</td>
<td></td>
<td>Maintained eye contact, body language not always appropriate e.g. pointing at the interviewer, close proximity, then arms folded, distracted at times, smiled frequently</td>
<td>Gained and maintained eye contact when appropriate, appropriate body language, focused, smiled frequently, no signs of anxiety</td>
</tr>
<tr>
<td>5 A</td>
<td></td>
<td>Very limited eye contact, anxious body language e.g. turned away from the interviewer, eye blinking, smiled very occasionally</td>
<td>Fleeting eye contact, appropriate body language, smiled occasionally, little signs of anxiety</td>
</tr>
<tr>
<td>6 A</td>
<td></td>
<td>Maintained eye contact, smiled when appropriate, uncertain facial expression, some signs of uncertainty/ anxiety</td>
<td>Gained eye contact when appropriate, smiled frequently, confident posture and body language e.g. smiling and hand flapping excitedly, no signs of anxiety</td>
</tr>
<tr>
<td>C1 B</td>
<td></td>
<td>Maintained eye contact, smiled frequently, looked a little uncertain e.g. hand to mouth</td>
<td>Maintained eye contact, smiled frequently, looked a little uncertain at times</td>
</tr>
<tr>
<td>C2 B</td>
<td></td>
<td>Maintained eye contact with the interviewer but hid her face from the camera, smiled frequently</td>
<td>Maintained eye contact, smiled frequently</td>
</tr>
</tbody>
</table>
There were some significant improvements in body language: eye contact; posture; and facial expression, focus and anxiety levels in 4 out of 6 of the participants in Group A. However, there was little change observed in both participants in Group B. This gives evidence towards showing that the use of MyChoicePad can develop confidence and social language skills.
**Discussion and Study Critique**

Analysis of the quantitative data suggests that using MyChoicePad does support expressive language in young adults with learning disability. The qualitative data goes someway to suggest that there were also some changes to social language skills.

If the research was to be replicated it would be interesting to use a statistical tool such as The Mann-Whitney U test or Wilcoxon test; this would demonstrate whether there was a statistically significant difference between groups.

**Question 1**
The research hypothesis for question 1 was accepted; that the percentage difference (progress made) will be greater in Group A than Group B. All participants made significant progress in being able to answer basic questions about themselves. There was a difference between the two groups but this was not as significant as the researcher initially expected. This progress in all learners does however; demonstrate that the different therapy that the participants received was effective; this is invaluable information for clinicians. There may have been a more significant difference if participant C1 did not use an augmentative system to back up his verbal responses. However, the researcher felt that it would not be ethical for participant C1 to respond without a system he is used to.

**Question 2**
The research hypothesis for question 2 was also accepted; that the score difference (progress made) will be greater in Group A than Group B. There was a significant difference between the groups in expanding expressive language. The group using MyChoicePad went from a mean utterance length of 0.6 to 3.3, whereas the group using other means of communication went from a mean utterance length of 0.4 to 0.8. Therefore, although Group B made progress in the amount of questions answered there was little progress made in expanding expressive language.

<table>
<thead>
<tr>
<th>Mean Utterance Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
</tbody>
</table>
Question 3
There was no hypothesis generated for question 3, however, qualitative data was generated by looking at changes in body language and asking a range of questions to people that spent time with the participants out of their therapy groups.

Observing the participants' body language gave some evidence that there were changes in confidence, willingness to communicate and social language skills. The changes were significant in some of the participants in Group A, in particular participant 5 had appeared very anxious during video one with little or no means of communication but when using MyChoicePad the body language and levels of anxiety in participant 5 changed dramatically. Participant 6 also had significant changes to facial expression and willingness to communicate. All the participants showed positive facial expression when they succeeded in expressing information when they had previous failed. However, there was little change in the body language of both participants in Group B.

The care givers were not aware of the purpose of the study so the responses in the questionnaires and in the verbal feedback should not be biased.

Despite observing obvious changes in confidence using MyChoicePad in research setting, the discussion with carers suggested that there was little generalisation of these skills to other settings. However, these findings will be significantly affected by the low response rate to the questionnaires and verbal feedback.

If the study was to be replicated it would be important to ensure that these questionnaires were returned or investigate other ways to elicit the same information.

Validity
The three main threats to external validity mentioned earlier in the text are: people, places and times. These three factors were difficult to control for in this study.

People:
Results of studies are limited if the research has been administrated to fewer than thirty people therefore there were some obvious limitations in this small scale study. There were only eight participants in the whole study. Ideally the study would involve over thirty participants and would be carried out in different settings. Although the sample was purposive, which can produce sampling bias, this was reduced by the fact that the participants were not selected from the same
geographical area. The specialist college recruits from all over the United Kingdom. Educational level was controlled to a certain extent in that all participants were diagnosed as having a SLD and all participants had similar receptive language abilities; 3-4 ICW level. There are also individual differences that may have affected the results e.g. disability, for example 3 out of the 8 have Down syndrome, 1 out of the 8 has an Autistic Spectrum Disorder (ASD), 3 out of the 8 have a hearing impairment (see Table 1).

Places and Times:
The venue for the data collection varied. 68% of the videos were conducted in the college’s speech and language therapy centre but some needed to be conducted in other rooms across the college campus.
The time of day also varied. These variables that were difficult to control for may have impacted on the external validity of the study.
The aim of external validity is to generalise the results beyond the limits of the study. Although the researcher cannot confidently state that the results indicate that MyChoicePad will support expressive language in all users, the results could be generalised to other young adults with learning disability with similar levels of understanding in a similar setting. It would be very interesting to conduct the research in other settings with a range of age groups.

Reliability
The reliability of a study is the extent to which similar results would be produced if the procedure was to be replicated.

Using a test re-test measure increases reliability but can also cause problems because the participants may learn the material. Some of the participants that had received therapy in the MyChoicePad group appeared to be answering the questions in the order they appeared on the grid. To increase the reliability the questions were asked again but in a different order, an average of the two scores was taken and used in the results.

Reliability relies on the accuracy of the tool used to measure the dependent variable. The dependent variable for question one was the ability to answer questions. This is the percentage of questions answered appropriately, intelligibly and meaningfully out of a series of questions. The dependent variable for question two was utterance length. This is the number of elements expressed either verbally or by using chosen AAC systems including MyChoicePad. These were measured by an untrained listener judging whether the answers were intelligible, meaningful and appropriate and by the researcher observing body language. It could be argued that these measures were subjective. If a standardised assessment was used to measure these the reliability of the study would be increased.
Clinical Implications and Conclusion

As a speech and language therapist it was encouraging to see that all participants made progress regardless of which therapy group they had attended. It was even more encouraging to see that all the participants in Group A; the MyChoicePad group, showed more significant progress in expressive language skills, both in answering basic questions and developing the structure of their language. There were also some significant changes in social language skills with this research group; they all enjoyed using the app and the facial expression in video 2 and 3 was positive when they succeeded in giving information to the listener. This has real implications for clinicians and practitioners working with young adults with learning disability.

As discussed earlier in the text MyChoicePad is a cost effective, interactive and fun way of users developing language skills and learning Makaton signing and symbols. When conducting the research, it was quick and easy to build the grids and there were no apparent difficulties with volume or access. In comparison to printing and laminating therapy materials using MyChoicePad saved a considerable amount of time. These findings link in with the findings of Insane Logic’s social impact survey in 2012.

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