

User testing of 3G telephones

**based on the needs of the deaf,
the hearing impaired and the deaf-blind**



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User testing of 3G telephones
based on the needs of the deaf, the hearing
impaired and the deaf-blind

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Foreword

This is the second report within the project **Testing of 3G telephones** being conducted in 2006 and 2007 by the Swedish Institute of Assistive Technology, the Swedish National Post and Telecom Agency and the Swedish Consumer Agency. The project focuses on deaf, hearing impaired or deaf-blind users of mobile videotelephony.

The first report set out the results of technical performance measurements and functionality mapping for a selection of 3G telephones on the Swedish mobile telephone market in the autumn of 2006. This report presents the results of an investigation of similar telephones conducted by a panel of deaf, hearing impaired and deaf-blind people.

Stockholm, August 2007
Swedish Institute of Assistive Technology



Ulrika Brändström
Head of section

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Background and purpose

The possibility of using sign language in video calls using 3G telephony has meant a revolution for many signing deaf people, enabling them to make telephone calls from almost anywhere. Before 3G telephony became available, they were limited to SMS and calls from fixed textphones or videophones only accessible in certain places.

In 2005, the Swedish National Association of the Deaf (SDR) raised the issue of quality tests for 3G telephones aimed at the needs of signing deaf users with the National Post and Telecom Agency¹. The Swedish National Association of the Deaf also contacted the Swedish Institute of Assistive Technology to enquire about carrying out the tests. This resulted in collaboration between the Swedish Institute of Assistive Technology (SIAT), the Swedish National Post and Telecom Agency (PTS) and the Swedish Consumer Agency (KOV) in a project to carry out comparative tests of 3G telephones.

Throughout the project, a reference group consisting of people from SIAT, PTS, KOV, SDR, the Swedish Association of Hard of Hearing People (HRF), the Association of Late-Deafened in Sweden (VIS), The Association of the Swedish Deafblind (FSDB) and the Interpretation Centre in Örebro met regularly to discuss the details of the project.

The first phase consisted of conducting comparative tests of 3G telephones from various manufacturers in the Swedish mobile telephony market². The test parameters can be grouped into the following categories:

- The quality of video calls in relation to sign language communication, lip reading or cued speech.
- Compatibility with hearing aids through the option to use induction loops instead of headsets, and the option to suspend usage of the GSM network.
- The option to use screen readers, e.g. for the use of speech synthesis.

Most tests focused on the quality of video calls. The basis for quality assessment was the ITU's³ guidelines⁴ for stationary videotelephony for sign language and lip reading. The 3G telephones tested did not meet the ITU's guidelines. Amongst other things, the ITU recommends a frame rate frequency exceeding 20 frames per second for unimpeded

¹ The Swedish National Post and Telecom Agency (PTS), **Mobile video communications for people who are deaf - Report on trial operations with broadband for people with disability** (2005).

² Richter, **Mobile videotelephony - Test of 3G telephones** (2007).

³ The United Nations' standardisation body for telecommunications

⁴ ITU-T, **Application profile - Sign language and lip-reading real-time conversation using low bit rate video communication** (1999).

sign language. The best frame rate frequency delivered by any of the tested 3G telephone was 14 frames per second.

The project conducted user tests to find out whether the quality of modern 3G telephones can meet the needs of the user groups. The tests were not carried out under laboratory conditions, but a group of users, the test panel, was given 3G telephones on loan, to use in everyday situations at home.

The purpose of the user tests is:

- To examine whether 3G technology is regarded as good enough for sign language communication. This technology is used by many deaf people today, but are further improvements needed?
- To examine whether hearing-impaired and late-deafened people are able to use lip reading and cued speech during video calls using 3G telephones.
- To examine whether there is a clear correlation between the technical performance/design of various telephones and different people's perception of the telephones' function.

Signing deaf people and late-deafened people use other methods of communication and are treated as two separate groups in the report. Signing deaf people use sign language as their first language, while late-deafened people generally use Swedish, or another language, as their first language. We assume that late-deafened people mainly use speech as their method of communication, with the aid of lip reading and cued speech, whereas signing deaf people do not require sounds or spoken language in their communications.

Method

The test panel was recruited through the Swedish National Association of the Deaf, the Swedish Association of Hard of Hearing People, The Association of the Swedish Deafblind and the Association of Late-Deafened in Sweden (VIS). Amongst the adult deaf group it was hard to find people interested in taking part in the tests. The representative from VIS in the project's reference group states that most VIS members are older, with little interest in testing technology which, at first glance, seems difficult to understand. Unlike people deaf from childhood, late-deafened people use Swedish or another spoken language as their mother tongue, and the SMS option can therefore be more attractive than video calls with lip-reading /cued speech.

The following number of participants from the respective associations applied to be part of the test panel:

- 9 people from Swedish National Association of the Deaf.
- 6 people from the Swedish Association of Hard of Hearing People.

- 4 people from the Association of the Swedish Deafblind.
- 1 person from the Association of Late-Deafened in Sweden.

To get as many assessments as possible in as short a time as possible, each panel member used one telephone for two weeks and then a second telephone for a further two weeks. In this way the test panel was also able to test more mobile telephones than if only one test period was used. 20 people took part in the test panel resulting in 40 assessments of the telephones tested.

Telephones

The telephones included in the user test were:

- the Sony Ericsson Z610i,
- the Nokia N73,
- the Samsung Z150,
- the LG U890,
- the Motorola V3xx,
- the Samsung Z240 and
- the LG U300.

The first four telephones were reviewed and documented in the previous report⁵. The Motorola V3xx came onto the market after the survey was carried out. The latter two telephones were replacements for the Samsung Z150 and LG U890 which had been removed from the manufacturer's product range when the telephones were procured for the test panel. Retailers of these telephones indicated that the Samsung Z240 and LG U300 were suitable replacements with similar functionality. Annex 4 contains the survey results for the above-mentioned mobile telephones.

Before the user tests, it was decided that induction loops would not be procured for the telephones. This was due to the difficulty of finding adapters to connect the induction loops to the telephones. Adapters were available to buy for some telephones, but as the point of the tests was to compare telephones, it was decided not to give out induction loops so as not to distort the results. The disadvantage of not providing induction loops to the test participants was that the hearing-impaired group were expected to have difficulty hearing sound during video calls.

Questions

A three-part question form was also provided in connection with the loaning of telephones to the test panel.

⁵ Richter, **Mobile videotelephony - Test of 3G telephones** (2007).

- Background questions: experience of using mobile or 3G telephone. Experience of calling videotelephony services, etc.
- Assessment of the telephone provided.
- Diary pages detailing the user experience in terms of the quality of each individual call.

The questions were developed in consultation with the reference group.

Some questions relate to grading where the results are collated as a mean value and displayed in a diagram. Most grading questions are followed by the opportunity to clarify the answer in order to facilitate analysis of the result. The grading questions on the diary page have four options: "Very good", "Good", "Average" and "Poor". In the section containing general assessments of the telephones, there are six grading options, ranging from "very poor" at one end of the scale to "very good" at the other.

Results and analysis

17 of the 20 persons included on the test panel have entered responses on the question form. One of the panel members chose to drop out when informed that the telephones would not be provided with induction loops. The results shown here are based on 34 assessments of the telephones and 179 diary pages (reports on each individual call).

Question form part 1: Background questions

Six of the seven hearing-impaired people state that they would buy a neckloop for their mobile if it was available in a general mobile telephone shop. Three people state that they currently use a neckloop with their mobile telephone. Nowadays, there are special shops selling technical aids for people with hearing impairments where neckloops can be purchased for mobile telephones, but availability would increase if they could be bought directly in the shop selling the mobile phone.

Question form part 2: Assessments of telephones provided

Fairly low quality during calls to videotelephony services:

3.3 (of a possible 6) is the average mark given when assessing the quality of calls to videotelephony services (Question 2). There are quite significant differences in responses, which can be due amongst other things to the test panel members' previous experiences with videotelephony services. Most comments mention that the interpreter worked well and that the picture was clear, but that sentences often had to be repeated.

Significantly more difficult to make calls with 3G telephone than with fixed videophone (Question 3, average 1.8 of a possible 6):

The test panel states that it is significantly more difficult to use 3G telephones than fixed videophones. Many mention that the advantage of using 3G is the ability to use mobile communications, but that the considerable differences that exist compared with fixed videophones in terms of clarity and picture size make 3G telephones more difficult to communicate with.

Divergent assessments of the quality of video calls (Question 4a, average 3.6 of a possible 6):

Some of the test panel find the quality of video calls good and some find it poor. The variation in responses is quite large, and signing deaf people give slightly higher marks than hearing-impaired people with regard to making video calls and attempting to use lip reading.

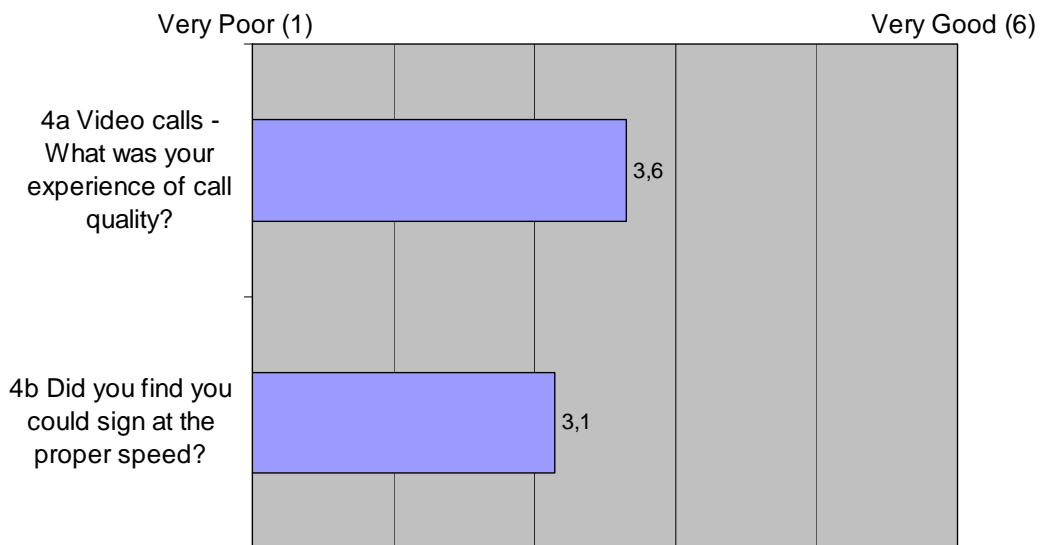


Figure 1: Assessment of telephones, Questions 4a and 4b: Average response for all telephones and users in respect of video call quality. The responses were assessed on a scale from 1 to 6, where 1 is very poor and 6 is very good.

Sorry, I didn't see what you said! (Question 4b, average 3.1 of a possible 6; Question 4c)

Signing 3G users are well aware that you often have to repeat yourself during video calls due to the fact that the picture often becomes blurred during expansive/rapid movements. It looks like the picture has frozen for a moment, which means subsequent signs are not visible. This makes it difficult to continue signing. In their responses to the question on whether it was possible to sign at the correct speed, users indicate that they have to slow down and make their signs plainer. The average mark is 3.1 of a possible 6, which indicates that test panel members found that the need to sign slowly disrupts

communication. Of 26 responses to question 4c "Did you or the person you were speaking to have to repeat yourselves often?" only 7 replied in the negative and the majority of responses indicated that both parties had to repeat themselves often. All models of telephone elicited negative responses.

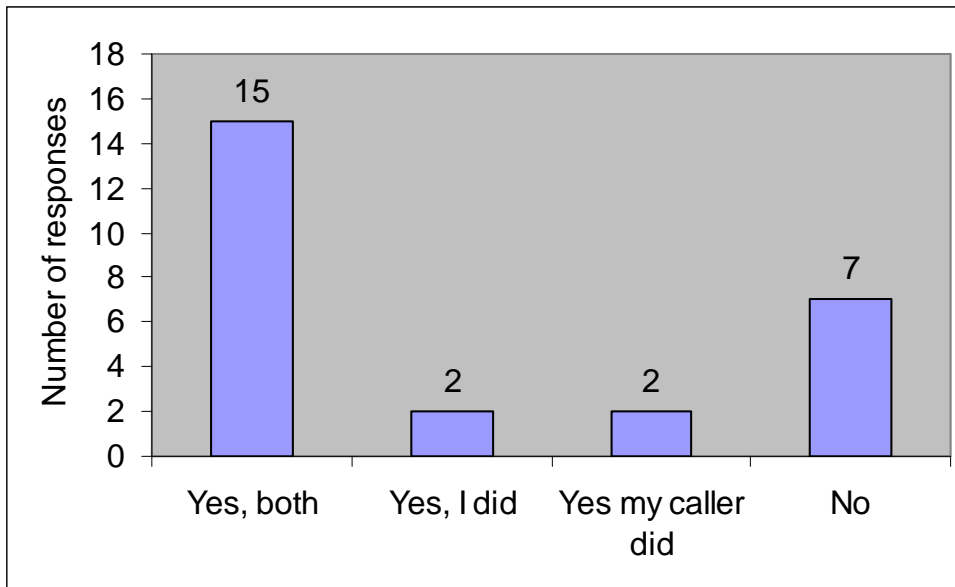


Figure 2: Assessments of telephones, Question 4c: "Did you or the person you were speaking to have to repeat yourselves often?". Response for all telephones and users. The values indicate the number of responses.

Video calls or spoken calls: The individual's requirements are key (Questions 5 and 6)

Few of the test panel gave responses to questions 5 and 6, which made the result difficult to interpret. The response to question 5 "Did you find it easier or more difficult to make video calls than ordinary spoken calls by mobile telephone?" indicates that the appropriateness of video calls still largely depends more on individual factors relating to the user than the technology itself. Some stated that it was significantly more difficult to use video calls than spoken calls, whereas others said it was much simpler.

It is unclear if hearing aids are affected by the telephone.

Question 6 asked hearing aid users if it is preferable for the telephone to use the 3G network only, as with this network, hearing aids are not affected to the same extent as when using the GSM network. Anyone who has ever had a mobile telephone knows that other electronic equipment is affected when an SMS message is sent or a call is made. This is due to the way information is sent using GSM (2G) technology. For some hearing aid users the levels of interference mean it is virtually impossible to hold the mobile telephone to the ear when talking. 3G telephones use a different technology which does not cause the same levels of interference, and most 3G telephones can be set up

so they only use interference-free technology. This also results in worse reception as the 3G network has worse coverage than the GSM network. Most models of hearing aid on the market in the last five years are not particularly sensitive to interference from mobile telephones. The only person on the test panel to test their telephone using a GSM network connection responded that he or she preferred the option of using the GSM network because the coverage is better. Because only one person answered the question and it is unclear whether that person had problems with interference to their hearing aid, the response is not very meaningful.

Difficulty with cued speech during video calls

The only person to have tested cued speech during video calls states that it is difficult to implement. Cued speech is just spoken language support which means the sound quality has to be good. Facial expressions and lip reading are also aids and the lack of synchronisation between sound and picture is probably the main reason video calls with cued speech are difficult to carry out. Low picture resolution and small screen sizes can also contribute, because they make it difficult to discern lip movements and facial expressions.

Inadequate screen illumination

To make video calls, the telephone network coverage must be good, and good illumination is required to achieve a high frame rate frequency. This means that good conditions for video calls ought to be outside in daylight. However, in order to make out what is being said, your screen must be sufficiently bright. The test panel is not satisfied with the screen's brightness, the average value for all telephones is 3.1 of a possible 6.

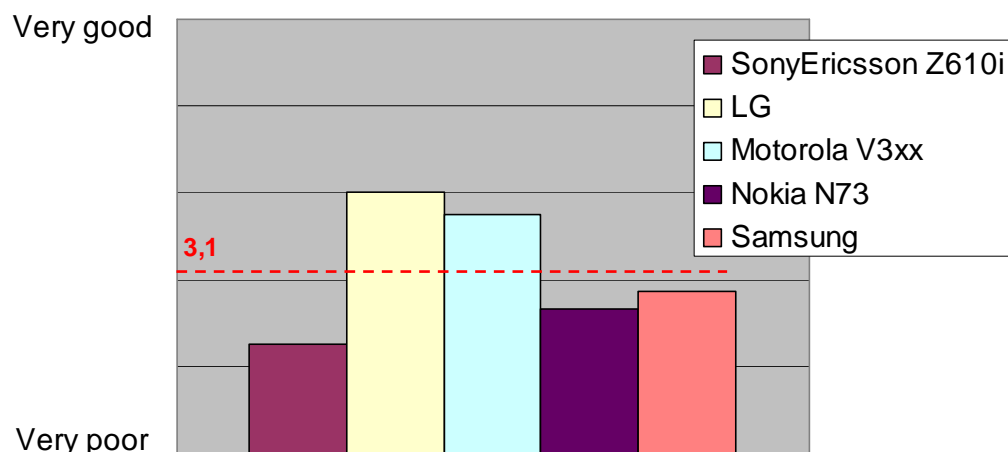


Figure 3: Question 8 - How well did the telephone's screen perform, e.g. was it bright enough to be visible in sunlight? The dotted line is the average value for all telephones.

One telephone proved to be better than the users' own telephones.

On the question of whether the loaned telephone performs better than the telephone they are accustomed to using, some people who used the Motorola V3xx responded that it performed better than their usual Sony Ericsson telephone. Several people who loaned an LG telephone say it performs worse than their usual telephone. The people who stated that the Motorola telephone is good and those who stated that the LG telephone is poor, have roughly the same experience of previous telephones; the Nec e616 and the Sony Ericsson Z800i.

No telephones live up to expectations

Of a total of 28 responses to the question of whether the telephone fulfils expectations, 18 (64%) were negative. It is clear from the comments to the question on what expectations the test panel had from the trial, that many hoped to test some new revolutionary 3G technology, which was not part of the test. Despite the fact that several people replied that they had not had high expectations of video calls, they stated that the telephone did not live up to expectations. No telephone elicited solely positive or negative responses.

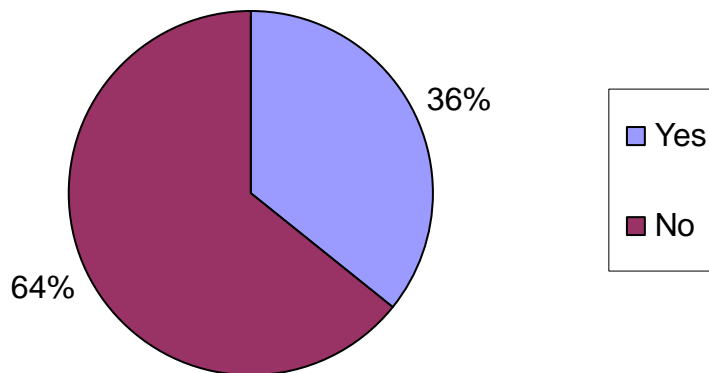


Figure 4: Assessment of telephone, Question 16: "Did the telephone meet your expectations?"

Inadequate video call quality

The majority of test participants did not think that the loaned telephone fulfilled their individual communication requirements. Of the people who responded in the negative, the majority indicated that the quality of video calls was too low. One person is satisfied with video call quality but thinks that it is difficult to write SMS messages with the (Nokia) keypad.

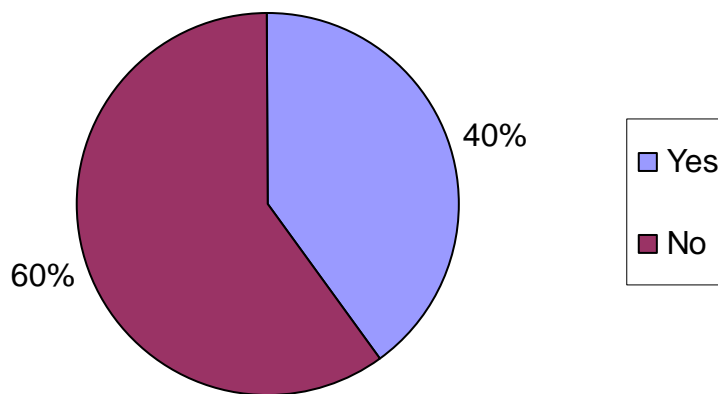


Figure 5: Assessments of telephones, Question 17: "Did the loaned telephone perform well enough to meet your communication requirements?"

Question form part 3: Diary pages

The test panel completed a total of 179 diary pages with assessments of each individual call. Certain participants completed more diary entries than others. This means that more assessments have been given for certain telephones and by certain user groups. Care should therefore be taken when interpreting the results for individual telephone models or user groups.

The experience of video call picture quality depends on the model of telephone.

The experience of video call picture quality depends on both the caller's and the call receiver's telephone. The picture seen on the call receiver's screen is the picture filmed by the caller's telephone and sent over the 3G network. If, for example, the picture of the person you are speaking with is poor, or if the picture is shaky or blurred, this is largely due to the other person's telephone and the 3G network.

Figures 6 and 7 respectively show the test panel's assessments of calls to (Figure 6), and from (Figure 7), other models of telephone. Calls to and from LG telephones generally receive low marks, irrespective of which party is using the LG telephone. The test panel is small, which means that individual assessments significantly affect the results. The previous report⁶ indicated that LG's telephone had low frame rate frequency which could be one of the reasons the test panel's assessments of the telephone are low. On the other hand, the Nokia and Samsung telephones tested also have low frame rate frequency but are not judged as poorly by the test panel. The marks for picture quality for calls made to Samsung telephones are relatively high, whereas marks for picture quality for calls from the Samsung

⁶ Richter, **Mobile videotelephony - Test of 3G telephones** (2007).

telephone are low. One possible explanation for this is that the Samsung telephone sends video with a high frame rate frequency, but cannot receive or process video sent with a high frame rate frequency. Frame rate frequency calculations during video calls between the Samsung telephone and the other telephones in the test have not been carried out due to time constraints. The Motorola, Nokia and Sony Ericsson telephones receive comparatively high marks both for calls made and calls received.

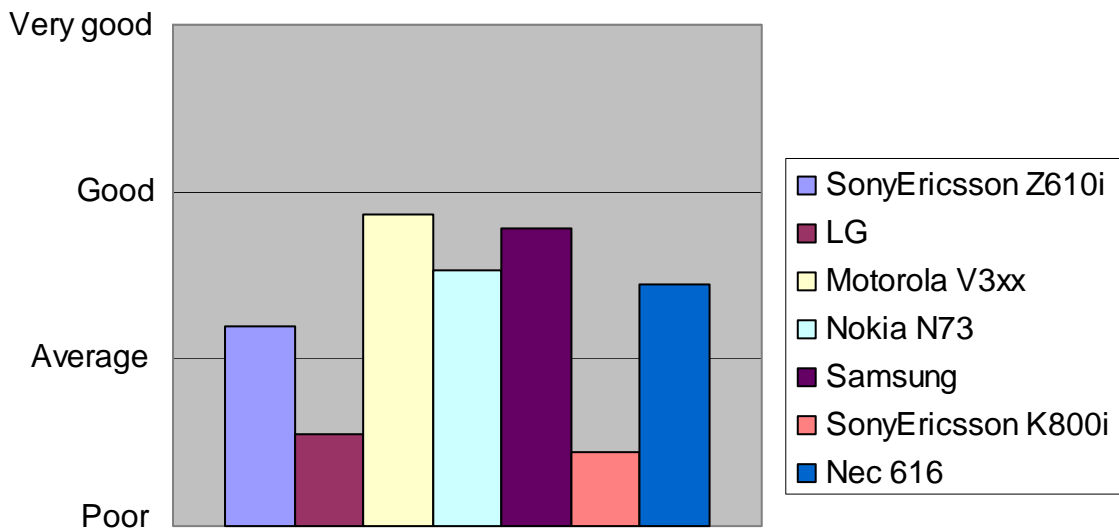


Figure 6: Diary page, Question 2a: "What did you think of picture quality?" Average mark for calls made to the respective telephones. The compilation applies to both sign language calls and video calls with lip reading.

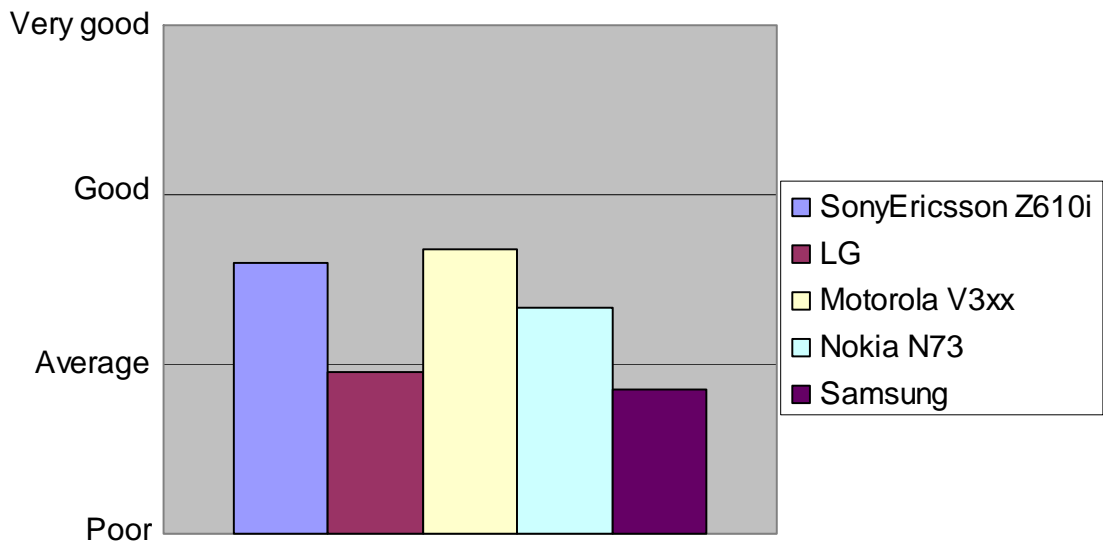


Figure 7: Diary page, Question 2a: "What did you think of picture quality?" Average mark for calls made from the respective telephones. Applies to both sign language calls and video calls with lip reading.

Lip reading is difficult when sounds and pictures are out of sync

The diary page included a question on the synchronisation of sounds and pictures, which is particularly important in calls where lip reading or cued speech is used. Five test panel members made a total of 19 calls where they tried to use lip reading. The mark for the synchronisation of pictures and sounds is low, and most written comments on this question indicate that lip reading is not possible. The reason given for this by certain members of the test panel was firstly poor synchronisation of pictures and sounds, and also low picture resolution and frame rate frequency. A delay can be acceptable during lip reading, but the sound must follow the video image. Low resolution, low frame rate frequency, small screen sizes and poor synchronisation are likely causes of lip reading difficulties.

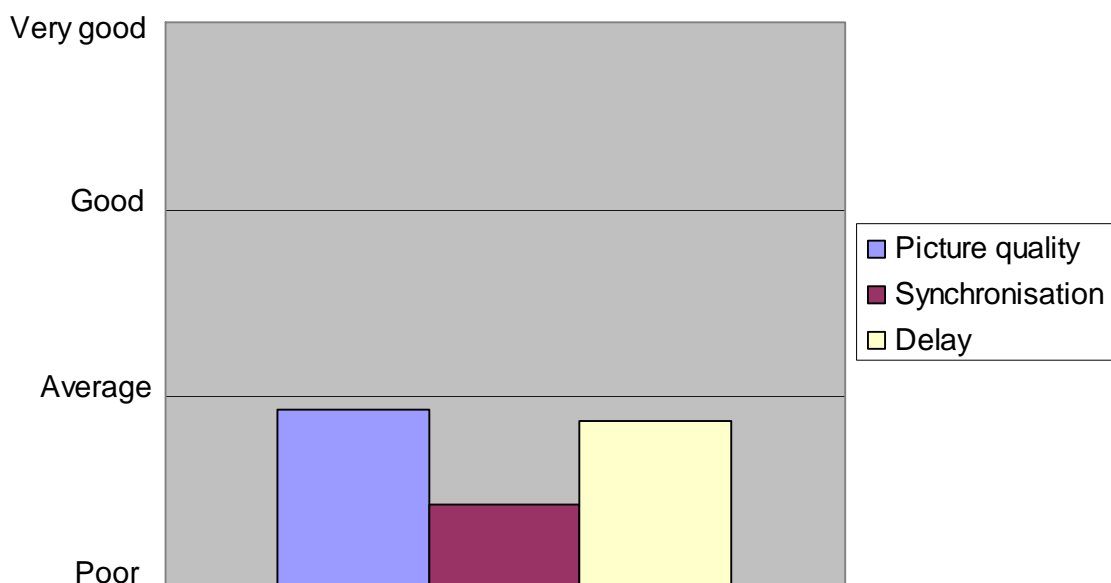


Figure 8: Diary page; picture quality, synchronisation, delay according to Questions 2a, 2b and 2c: Selection only for calls with attempts at lip reading (5 people, 19 calls). These calls are assessed as very poor, in particular with regard to the synchronisation of pictures and sounds.

Comparison between the survey results and the test panel's assessments - large camera angle and high frame rate frequency are important

It is difficult to draw any conclusions on the correlation between the telephone's measured values and the test panel's assessments. The test panel is small and the result coloured amongst other things by the participants' previous experience of 3G telephones.

The test panel's assessments of picture quality do not correlate directly with the telephones' frame rate frequency. Of all the telephones tested by the panel, the Sony Ericsson telephone had the best frame rate

frequency, followed in descending order by the Motorola V3xx, the LG U300, the LG U890, the Samsung Z240, the Nokia N73 and the Samsung Z150. According to the calculations, the Sony Ericsson and Motorola telephones were the only ones with a frame rate frequency in excess of 10 frames per second. It is true that the test panel gives the highest mark for picture quality to the Motorola and Sony Ericsson phones for calls made from the telephones (see Figure 7), but the differences with the other telephones are not large. The test method for calculating frame rate frequency is not completely reliable, as results can vary depending on the 3G network's load, light conditions, etc.⁷. To increase the method's reliability, more calculations need to be performed at other times of the day.

The perception of a telephone is coloured by several factors which makes it difficult to judge a telephone's quality from the frame rate frequency alone. An example of this is that the quality of video calls made to a Samsung telephone are adjudged to be good, despite the fact that the Samsung telephone has a low frame rate frequency. A good telephone must have a high frame rate frequency, but for example camera angle, the camera's position and how the telephone copes with changes in light conditions also contribute to making a telephone more or less suitable for videotelephony.

The Motorola V3xx is different from the other telephones in the test because it has a large camera angle. This means that, when signing, the telephone does not have to be held far from the body. The large camera angle combined with the fact that the frame rate frequency is about the same as that of the NEC e616⁸ is probably the reason the Motorola was given high marks by the test panel.

Other comments

The test panel also comments that:

- It is difficult to find video call settings in the telephone. Settings should also be available to switch off the telephone's microphone and loudspeaker during video calls.
- The telephones ought to have a torch/light which is directed at the caller when the call is made. This would make it easier to make calls in poor light.
- A keyboard with a keypad that makes it easy to write SMS messages would be a good idea.

⁷ Richter, **Mobile videotelephony - Test of 3G telephones** (2007).

⁸ Richter, **Mobile videotelephony - Test of 3G telephones** (2007).

Discussion

The people taking part in the test panel have different experiences of video calls with 3G telephones. Signing deaf people constitute the more experienced user group and tend to give slightly higher marks than those who were not previously used to video call communications. This can be partly attributed to the fact that deaf people who are used to communicating with sign language via video calls have lower expectations of quality, and that people with impaired hearing who tried to use lip reading during video calls found it difficult.

The view of the Association of the Swedish Deafblind is that there are too few mobile telephones with support for magnification programs and speech synthesis. Currently only Nokia telephones support speech synthesis and magnification programs. There are also Braille displays which can be connected to mobile telephones with Bluetooth, but at the moment only a few mobile telephone models support this functionality. One function which the Association of the Swedish Deafblind would also like to see is an option for users to select the size and colour of the text and background themselves. Mobile telephones with built-in GPS can also be used, e.g. when a taxi takes you to the wrong address and you have to call another taxi or get help with directions. The above views also apply to GSM telephones.

Six key points for the future development of 3G telephones:

- Frame rate frequency during video calls needs to be higher to improve the rendering of rapid movements.
- Sounds and pictures need to be synchronised to enable lip reading and cued speech.
- Higher picture resolution is required so that finger movements and facial expressions can be seen better.
- Standardised headset interfaces are needed to facilitate the use of induction loops or other hearing aid devices.
- A large camera angle in cameras used for video calls is necessary for sign language usage, and a zoom option can facilitate lip reading.
- Better screen illumination should be introduced but not at the expense of any of the points mentioned above.

The first thing operators and manufacturers should do is improve their product information so it is clearer which models of mobile telephone are suitable for videotelephony with sign language, which telephones are suitable for persons with visual impairments and how induction loops can be connected to mobile telephones.

Conclusion

Do mobile video calls need to be further developed to cope properly with sign language communications?

It is clear from the test panel's opinions that today's 3G telephones are suitable for simple sign language communication. However there are still some problems: the picture quality experienced is not particularly good, and people are forced to repeat themselves often to make themselves understood.

Can hearing-impaired and late-deafened people use video calls with 3G telephones for lip reading or cued speech?

The test results show that is not possible to use video calls with 3G telephones for lip reading or cued speech. The most probable reasons for this are lack of synchronisation between sounds and pictures and low picture resolution.

Is there a clear connection between the telephones' technical performance and video call functionality?

The test results do not show a significant connection between the telephones' technical performance and the test panel's assessment of their video call functionality. The marks given to video calls from telephones with high frame rate frequency are higher than those given to telephones with low frame rate frequency, which could indicate a connection between frame rate frequency and call quality. However, the high marks given to calls made to telephones with low frame rate frequency contradict this.

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Annex 1: Background questions

Background questions:

In order to get an impression of you as a mobile phone user, we would like you to answer a few background questions about you and how you use your mobile phone.

- 1) There are four user groups represented in the test panel: deaf, hearing impaired, late-deafened and deaf-blind people.

Which group do you represent?

- SDR/ Deaf people
- HRF/ Hearing impaired people
- VIS/ Late deafened people
- FSDB/ Deaf blind people

- 2) **What expectations do you have on the mobile phone that you borrowed? Describe freely!**

Do you believe you can, e.g. use the phone for sign language video phone calls, lip-reading video phone calls or only send sms?

How do you use your own 3G or GSM mobile phone?

- 3) **Have you used a 3G mobile phone to phone video calls before?**

YES NO

If you answered yes:

- a) What mobile phone brand and mark have you used before?

- b) How often do you call video phone calls?

- daily
- a few times per week
- a few times per month
- never

Annex 1

c) How often do you send sms?

- daily
- a few times per week
- a few times per month
- never

4) **Do you use your phone without calling video phone calls**

- YES NO

5) **Do you have difficulties using an ordinary mobile phone?**

- YES NO

If you answered YES:

a) Why?

6) **Do you predominantly use sign language to communicate (i.e. not speech)?**

- YES NO

7) **Are you hearing impaired and if so, do you use a hearing aid?**

- YES NO

If you answered YES:

a) Can you use speech calls in a mobile phone without problems?

- YES NO

b) Do you use a neckloop with your mobile phone?

- YES NO

c) Would you use a neckloop for your mobile phone if it would be sold in the store where you bought your mobile phone?

- YES NO

d) Do you think mobile phone calls would be easier for you if you could use high quality video phone calls to get lip-reading support?

- YES NO

8) **Do you have a visual impairment?**

YES NO

a) Do you find it difficult to see written text?

YES NO

Questions about the video relay service

9) **How often do you use the video relay service for ...**

a) ...3G video phone calls?

- daily
- a few times per week
- a few times per month
- a few times per year
- never

b) ... stationary videophone calls (e.g. with Allan eC or MMX)?

- daily
- a few times per week
- a few times per month
- a few times per year
- never

Annex 2: Assessments of telephones provided

Questions on your experience of the telephone you have loaned

In order to assess your experience of the phone that you have borrowed for these two weeks, we would like you to answer the following questions. Apart from the questions below, we would like you to use the “diary pages” to take notes on separate phone calls.

- 1) Which phone did you use (the number can be found on the box you got the phone in)?**

The number of the phone: _____

Questions about the video relay service

If you don't use sign language, go to question 6.

- 2) How did you experience the quality when communicating using the video relay service?**

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Motivate:

- 3) Is your experience that it is harder or easier to use video calls using a 3G mobile phone than it is using a stationary videophone (e.g. Allan eC or MMX)?**

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6	Not relevant
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Motivate:

Questions about video phone calls using sign language

If you don't use sign language go to question 5.

4) If you have tested video phone calls with the phone you have borrowed:

- a) What was your experience of call quality?
(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6	Not relevant
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Motivate:

- b) Did you find you could sign at the proper speed?
(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6	Not relevant
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- c) Did you or the person you were speaking to have to repeat yourselves often? (mark with a cross)

Yes, both Yes, I did Yes, my caller did No

- d) If you know your friend's mobile phone brand and if the quality has been good or bad, can you please fill in what brand/model your friend has and whether it was better or worse calling to compared to other brands or models!

Questions to you who usually calls speech phone calls:

Go to question 7 if you usually don't use lip-reading for speech understanding support.

5) Did you find it easier or more difficult to make video calls than ordinary spoken calls by mobile telephone?

(Grade from 1 to 6, 1 being much harder to make video calls and 6 being much harder to make spoken calls)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 6) If you usually have problems speaking in an ordinary GSM mobile phone due to interference in your hearing aid, you can set the phone you have borrowed into a mode which uses only the 3G network, thereby reducing the likelihood of interference. (you can find an

instruction on how to do this on a separate sheet)

If you have turned off the phone's use of the GSM network, did you prefer that to using the GSM network, despite possible drawbacks in coverage?

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Motivate:

Questions about video phone calls with cued speech

If you don't use cued speech, skip this question.

7) Using cued speech, how do you experience video phone calls with the phone you have borrowed?

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

General questions about video phone calls:

8) How well did the telephone's screen perform, e.g. was it bright enough to be visible in sunlight?

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Motivate:

9) Does the camera adapt well to changes in light conditions?

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Motivate:

10) Have you changed any setting for video phone calls? Which settings and why?

11) Do you think the opportunities to change settings are good, e.g. light sensitivity, zoom, turning off the sound? Is there something missing or superfluous?

12) Do you experience any reactions from your calling party, e.g. have they told you that they consider your borrowed phone to be better or worse than your own mobile phone?

General questions about the mobile phone:

13) Do you consider the menus as easy or hard to navigate?

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14) Was the size of the buttons to your satisfaction?

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15) Did you find the functions of the buttons easy to understand?

(Grade from 1 to 6, 1 being very poor and 6 being very good)

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16) Did the telephone meet your expectations?

YES NO

Motivate:

17) Did the loaned telephone perform well enough to meet your communication requirements?

YES NO

Motivate:

18) Other comments

19) If you haven't used video phone calls with a 3G mobile phone before this test, will you start using it now?

20) Try calling at different times in different situations, e.g. outdoors in daylight, indoors, during daytime, during night and with or without moving background. Write down the conditions during your phone calls in the provided diary pages!

Annex 3: Diary pages

Diary page

Telephone number:

1. What sort of call did you make?

- Video (with sign language) Speech
 Video (with lip-reading) Video (with cued speech)

2. What did you think of:

a. Picture quality?

- Very good Good Average Poor

b. **Synchronisation between sound and image?**

- Very good Good Average Poor

c. **Delay (poor if it takes long time to get a response, or if you and your party frequently interrupt each other)**

- Very good Good Average Poor

3. Did you call using the video relay service?

- Yes, phone call Yes, interpretation No

4. What were the light conditions during the call?

- Daylight, outdoors Bright, indoors Dark indoors
 Dark outdoors

5. What were the conditions around you during the call (you can choose several options)?

- Still Lot of movement Quiet Noisy

6. If you know what phone brand your call party had, write it down (if you called another person taking part in the test, you can write the phone number)

7. Other comments:

Annex 4: Supplementary calculations

The table below sets out the calculations made in accordance with the method described in "**Mobile videotelephony - Test of 3G telephones**, Swedish Handicap Institute 2007". The telephones mentioned below have been used by the test panel.

Telephone	Motorola V3xx	Samsung Z240	LG U300	Sony Ericsson Z610i	Nokia N73	LG U890	Samsung Z150	NEC e616 (reference)	ITU recommendations ⁹
Synchronisation	0.3	0.3	0.1	0.13	0.25	0.09	0.01	0.3	< 0.1
Delay, picture (s)	0.6	0.9	0.7	0.35	0.68	0.65	0.6	0.7	< 0.8 is acceptable, < 0.4 is good
Delay, sound (s)	0.3	0.6	0.6	0.48	0.43	0.73	0.6	0.5	< 0.8 is acceptable < 0.4 is good
Frame rate frequency (Hz)	11	7	9	14	6.7	7.6	6	12	>20 is good, > 12 can be used with difficulty < 8 is unusable
Own picture size (width x height in mm)	12 x 10	11 x 9	9 x 9	10 x 9	10 x 8	8 x 8 – 13 x 13	10 x 8	12 x 10	–
Other party's picture size (w x h in mm)	44 x 28	43 x 27	32 x 26	28 x 22	36 x 30	35 x 28	30 x 25	33 x 27	–

⁹ ITU-T, **Application profile – Sign language and lip-reading real-time conversation using low bit rate video communication** (1999).

Annex 4

Telephone	Motorola V3xx	Samsung Z240	LG U300	Sony Ericsson Z610i	Nokia N73	LG U890	Samsung Z150	NEC e616 (reference)	ITU recommendations ⁹
Signing space at a distance of 80 cm – camera angle (w x h in cm)	88 x 63	66 x 53	73 x 55	70 x 58	70 x 57	70 x 57	64 x 52	85 x 68	–
Are screen illumination settings available	Yes	No (contrast only)	No	Yes	Yes	No	Yes	Yes	–
Can GSM be disconnected	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	–
Is an induction loop (neckloop) an original fitting	No	No	No	No	Yes	No	No	2.5 mm jack plug	–
Is Braille display function available	No	No	No	No	No. Speech synthesis however is available	No	No	No	–
Is it possible to call the Communications Service for Videotelephony	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	–
Clamshell	Yes	Yes	Yes	Yes	No	Yes	No	Yes	–
Location of the camera	In the hinge	In the hinge	In the hinge	In the cover above the screen	Above the screen	In the hinge	Above the screen	In the cover above the screen	–

User testing of 3G telephones based on the needs of the deaf, the hearing impaired and the deaf-blind

This is the second report within the project Testing of 3G telephones being conducted in 2006 and 2007 by the Swedish Institute of Assistive Technology, the Swedish National Post and Telecom Agency and the Swedish Consumer Agency.

The report presents the results of an investigation of 3G mobile phones conducted by a panel of deaf, hearing impaired and deaf-blind people. Focus of the investigation was primarily on the possibility to use sign language, lip-reading and assistive signing when using the videophone feature.

The Swedish Institute of Assistive Technology in co-operation with



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The Swedish Institute of Assistive Technology

The Swedish Institute of Assistive Technology (SIAT) is a national resource centre on assistive technology and accessibility for persons with disabilities.

SIAT works for full participation and equality for persons with disabilities by ensuring access to high-quality and secure assistive technology, an effective provision of assistive devices and an accessible environment.

The activities of the Swedish Institute of Assistive Technology cover:

- testing and support to procurement of assistive devices
- research and development
- analyses of needs, knowledge and methodology development
- training and capacity building
- international cooperation
- information and communication

The Swedish Institute of Assistive Technology is run by the Ministry of Health and Social Affairs and the Swedish Association of Local Authorities and Regions (SALAR).



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