Some Methodological Issues in Experimental Phonetics: Sampling Techniques and Recording Equipment

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ملخص البحث:

يهدف هذا البحث إلى مناقشة بعض القضايا المنهجية في دراسة الأصوات بوجه عام، وخواصها الطيفية بشكل خاص. كما يُعدُّ محاولة جادة في مجال صوتيات اللغة العربية في ليبيا للنظر في مجموعة من المسائل حتى يصل الباحث إلى نتائج صحيحة وموثوقة وقابلة للتعميم. هناك عدد من العوامل التي يجب على الباحث مراعاتها قبل القيام بعملية تسجيل مادة البحث، وتحليلها. وتشتمل هذه العوامل على المتكلم والمادة الصوتية المراد تسجيلها ومكان التسجيل وأخيرًا المعدات المستخدمة في عملية التسجيل. أما ما يتعلق بالمتكلم المراد تسجيله، يجب أن يكون متحدثاً أصليًا باللغة أو باللهجة المراد دراستها. كما يجب على الباحث الإهتمام ببعض المعلومات حول المتكلم المراد تسجيله والتي منها عمره وجنسه وحالته الصحية ومستواه التعليمي ومهنته وخلوه من أي مشاكل في النطق، أو في السمع. أما مادة البحث، فيجب على الباحث أن يقرر طبيعة هذه المادة؛ قد تكون كلمات منفصلة أو جمل أو تراكيب تحتوي على ما يسعى الباحث إلى دراسته، أو محادثات عفوية لبعض المتحدثين باللغة المراد دراستها. كما يعد اختيار بيئة هادئة أمرًا ضروريًا وذلك لضمان جودة التسجيلات المراد تحليلها. بالإضافة إلى ذلك، يجب أن يختار الباحث مكانًا هادئًا ويُفضل أن يكون غرفة عازلة للصوت لتقليل الضوضاء بقدر الإمكان. أما من الجانب التقني، فيجب على الباحث استخدام مسجل صوت عالي الجودة مع لاقط صوت مكثف بدلاً من لاقط صوت عادي. وأخيرًا، يجب على الباحث التقليل من تأثير وجوده أثناء عملية التسجيل. حيث يؤدي وجود الباحث مع معدات التسجيل إلى قلق الشخص المراد تسجيله مما قد يؤثر في طبيعة مادة البحث. كما يجب على الباحث خلق بيئة ودية أثناء عملية التسجيل وذلك للحصول على المادة المطلوبة. إذا تم أخذ هذه القضايا بعين الاعتبار، فإن النتائج التي سيتم الحصول عليها ستكون صحيحة وموثوقة وموضوعية وقابلة للتعميم.

Abstract:

This paper is an attempt to cover some of the factors that need to be considered when conducting phonetic research, in general, and in acoustic phonetics in particular. The aim is to help young Libyan phoneticians to become aware of some of the main methodological issues in experimental phonetics, to guide them through some tips to conduct research on Libyan Arabic and reach results that are valid and reliable. There are a number of issues that researchers need to pay attention to before recording their data. These include the speaker, the material, the environment and the equipment. Regarding the speaker, the researcher needs to pay attention to some information about the physical character of the speaker such as his age, sex and medical history. Information about the language background of the speaker is also of equal importance. Here, the researcher needs to check the speaker's first and second language, dialect, level of education and profession. The speaker must be a native speaker of the language or the dialect under investigation. As for the material, the researcher should decide what type of material to collect in order to test what he aims to test. Choosing a quiet environment is very vital to the quality of the material to be recorded. The researcher should choose a quiet place, preferably a sound-proof room to minimize background noise. The researcher should also look for ways to minimize the observer paradox, where the presence of the researcher and the equipment may influence the naturalness of the data to be collected, by establishing a friendly environment and distracting the mind of the speaker that he is being recorded. As for the equipment, the researcher should use a high quality recorder with a condenser microphone instead of dynamic microphones. Taking these issues into consideration will not only validate the results, but also make them reliable, objective, and can also be generalized.

Introduction:

It is clearly established in linguistics that the process of conducting research should reflect precision, validity and reliability. Starting from defining a frame-work and narrowing down a research question to developing a hypothetical answer and choosing the best methodology, the researcher should take into consideration numerous issues and control for many variables. In this sense, phonetics is no different. In order to study any

language, phoneticians should pay attention to several factors before embarking on the study of their target language. For example, they should focus on the sample of their population, the data to be elicited from this sample and finally the equipment that is to be used in recording and analyzing the data. This is to ensure that their results *can be generalized* beyond the sample of their population.

In the last two decades there has been a growing number of studies on the phonetics and phonology of Libyan Arabic (LA). In particular, more attention has been paid to the acoustics of speech sounds of LA. However, some of these studies have created a rather unclear picture of Libyan Arabic and its main dialects. This paper is intended for young Libyan phoneticians planning to carry on phonetic experiments on any variety of LA. It is an attempt to shed some light on some of the factors that those phoneticians should be aware of during the process of their studies. Specifically, the paper aims to investigate the main methodological problems encountered when those phoneticians prepare for their phonetic experiments, collect their data and analyze it. The aim is twofold: to discus some considerations regarding the sample of the study, and to discuss in detail the equipments and methods of recording and displaying speech. What is also of interest to this paper is to show how experiment planning and data selection for analysis can lead to producing research that is systematic, interesting and worth investigating.

Overview of the Research:

Conducting research in phonetics can be placed under two main kinds of research: experimental research and predictive research. Auer (1959:41) defines experimental research as "The systematic study of the operation and effect, or causal relationships of a single variable factor…controlled or manipulated in a situation where all other factors are held constant". On the other hand, Wisker (2001:73) states that predictive research deals with several variables and predicts specific results. These two kinds of research are involved in the framework of acoustic phonetics. This sub-field of phonetics studies the physical characteristics of speech sounds. Speech signals that travel through the air are received by the human ear, passed to the brain where they are decoded to make sense of what has been produced. Phoneticians are interested in studying these signals, or to be more

specific, the physical characteristics of speech sounds as produced by native-speakers of the language being studied.

The lack of acoustic analysis in the study of LA in the past has led to different conclusions regarding LA. For example, when investigating the vowel inventory of LA, different vowels have been reported. While Elfitoury (1976, cited in Abumdas 1985:41) and Albashir (2008) identify eight vowels; Aurayieth (1981:21) and Laradi (1983:15) respectively report nine vowels. On the other hand, Abumdas (1985: 41) reports ten vowels in LA. Apart from Laradi who was very specific about the variety of LA she was investigating, and Pereira (2001, 2007, 2008) who gave a meticulous attention to detail on LA and is still working the dialects of Libya, the rest of researchers used the term "Libyan Arabic" to refer to dialect they were investigating. This could also be related to the fact that most of the studies have been carried out using old and sometimes impressionistic methods. Research in phonetics should not be exclusively based on impression, i.e. the human ear, but rather on objective and scientific methods. To sum up, there is some confusion with regard to the study of the varieties of Arabic spoken in Libya, and this paper aims to address two main methodological issues that may be the source of this confusion. Researchers should pay attention to these issues, in order for them to clear any ambiguity about this variety of Arabic.

The rest of this paper is dedicated to discussing two main methodological issues in addition to some problems to consider when conducting experiments in phonetics in general, and on LA in particular. The two issues of concern are: the sample of the research and the equipment used to record, display and analyze the data. The sample of any research refers to the participants who will be recruited to take part in the experiment. Here, the characteristics of a good representative sample including the physical state of the participants and whether they suffer from any speech disorder or any hearing impairments, will be discussed. This section will also investigate issues such as age range of the sample and their gender. The second section will focus on the importance of using adequate and reliable equipment to record a high quality signal.

The Sample of the Study:

Specifying the group of people to collect data from is one of the most important questions to ask before starting the process of data collection. Since it is almost impossible to collect data from every single member in the target community, only some speakers are chosen to draw the data from. This process is known as sampling (De Vaus 2001). While sampling seems easy and straightforward, there are many issues that need to be taken into account when choosing a sample from the population. The first issue is whether the sample chosen can be a suitable and representative sample of the whole population. Buchstaller and Khattab (2013) argue that the notion of "representativeness" can only be presumed when characteristics of the sample match that of the whole population. In this respect, choosing a suitable sample size will ensure that this sample is a true reflection of the population. The larger the sample, the more representative it becomes.

To choose a sample that is representative of the population, the researcher first needs to exactly specify the region under investigation. For example, instead of stating that the study investigates LA, researches need to, they need to limit their study to the dialect spoken in Tripoli, in Benghazi or in any region. They may also draw some boundaries from where their sample was chosen, a specific region or that city, in order to avoid any possible dialect mixing. Once the region of interest is chosen, participants should be randomly recruited from different neighborhoods of the specified region or city. As De Vaus (2001: 60) puts it "the surest way of providing equal probability of selection is to use the principle of random selection". The idea of randomly choosing the research sample steers the researcher away from being biased when choosing a sample. However, Milory and Gordon (2003) point out, it is sometime difficult to avoid being biased in choosing a sample, but the researcher can avoid family members and relatives, and choose participants from all sub-groups of the region under investigation.

After recruiting the participants, there are a number of issues to pay attention to. Ladefoged (2003:13) suggests some questions to ask the participants before recording. The main question is whether the language or dialect of interest is the speaker's mother tongue; does the speaker use the language in his daily life? Does he have all his teeth? Is he intelligible and loud enough for others to hear? Articulation disorder is a very wide term,

but having any kind of articulation disorder is an important matter to pay attention to. According to Crystal (1980:200) the term can fit in many descriptions. When a person is said to have an articulation disorder, he or she is either not intelligible at all or is having a problem in pronouncing a single sound or a group of sounds. Abnormal articulation is the result of a cleft lip, absence of some teeth, the teeth are misaligned, or because of the size of the tongue and its shape.

The gender of the person to be recorded is another matter to decide upon. There is a strong relationship between the gender of the participant and the acoustic signal they produce. Samuelsson (2006: 6) argues that there are some acoustic cues which are unique to the gender of the speaker. This suggests that our expectations of the person speaking affect our accurate perception. While some state that women produce shorter vowels, because of having shorter vocal tract, and articulate more because of the prestige or standard level they approximate at (Simpson, 2000), others state that women produce longer vowels and speak at a slower rates than men (Whiteside, 1995). The general agreement is that men cover a greater articulatory distance while women cover a greater acoustic space to produce the similar acoustic products.

Accent of the speaker to be recorded may affect the experiment. The speaker should speak a standard variety without any mixed-dialectal accent. Nolan (1983:84) states that the best approach to identify the characteristics of a speaker's language is to control accent variation. The language should be his/her mother tongue and not his second language. In this respect, bilinguals are not eligible. By controlling the accent, the experiment will reflect generalizability. The participants in the experiment should be native-speakers of the language who have no previous knowledge of any other language, like taking some courses, or living in another country for a period of time.

The age of the participants should range between 20 and 50. This is to avoid the random choices of children and the possibility of having any hearing problems in elderly people. To ensure that none of the participants suffer from any hearing problems, they should be tested before conducting any recording. According to Crystal (1980:200) the frequency of normal conversational speech at about one meter distance is 60 decibels (the frequencies between 250 and 8000 KHz). If the person is not able to detect sounds, he is

said to have one of the types of hearing impairment or loss. If the researcher suspects that one of his participants has any hearing problems, his/her should be excluded, and if they have been recorded, their results should be excluded from the analysis.

Recording and Analyzing the Data:

Choosing the recording equipment is very vital when conducting research in phonetics. This is not an easy task. Ziegler et al. (1997: 263) state that "most of the equipments currently available are less powerful as far as the control of task variables in speech and listening experiments are concerned". With a wide variety of recording equipments, choosing a reliable one is very crucial and difficult at the same time. For example, Tatham and Morton (1997: 3) state that choosing a method of recording and displaying speech is equally important. The method should be evaluated on the basis of the quality of the signal. The signal to be recorded should match the real signal without distortion. Some of these techniques of recording are summarized in the following sections

There is a large variety of equipment for recording and displaying speech. These include tape-recorders, CD recorders, memory records and laptops. In recent years, cell phones have different applications for voice recording. For non-professional use, most of these are handy and efficient. However, for professionals or researchers who are working on spoken language, these methods of recording are not adequate. Researchers in the field of Phonetics need to use a good recording equipment to obtain a high quality signal. For example, Digital Audio Tapes (DAT) were widely used and they were famous for their high quality recording. However, they are no longer manufactured. CD recorders that have mini CDs are very practical; however, they also have their share of problems. These recorders require a mini-disk which is becoming rare to find due to advancement in technology. In addition, recording and erasing many times on the same CD will affect the quality of the signal and make the recording invalid for experiments. Laptop computers can record speech because they are equipped with software and an output for a microphone. However, they have a poor signal-to-noise ratio, i.e., they record background noise even when the quality of the microphone is excellent. This is because of the sound-card which is built in the laptop. If a good sound card can be integrated into the system, laptops can be

used in recording high quality signals that contains no distortion or background noise (http://www.questiontools.com/news recording speechmin.html).

As discussed above, background noise is the main problem to deal with when a researcher wants to obtain a high quality recording. There are some useful tips on how to avoid background noise. Ladefoged (2003: 21) states that the microphone should be placed in the right position, not very close and not very far from the speaker. Oliveira et al., (2008) state that the researcher can place a small mirror on the wall to help the speaker maintain the same position and the same distance between him and the microphone.

The level of the volume when recording should be constant and high all the time, so that the voice of the person being recorded is higher than the background noise. The room should be quiet and sound-proof. If the researcher is not sure of the validity of a recording, he/she can test it. Lieberman and Blumstein (1988: 73-74) suggest three important criteria that a good recording should meet. The recording should be an accurate representation of the acoustic signal; the noise should be minimized so that the signal will be at least 20dB above the level of background noise, and finally, the quality of the recording should be high to allow long time storage and quality preservation of the file.

The quality of the microphone is very important as well. Directional microphones, which respond to sounds coming from one direction, are very effective. They are adequate to pick up "the format frequencies or fundamental frequency pattern of an utterance" (Lieberman and Blumstein, 1988:74). There are also other recommended microphones like condenser microphones and electric microphones. While dynamic microphones are simply designed and are appropriate for non-professional recording, condenser and electric microphones are more sensitive and appropriate in professional recording. They are very efficient in picking up very clear signals without any noise (http://www.phon.ucl.ac.uk/ resource/audio/recording.html). In addition, using an anti-pop filter is very helpful in obtaining a high quality recording. Oliveira et al. (2008) point out that an anti-pop filter should be used to reduce the influence of the air on the microphone, especially when recording wording containing plosives.

The data to be collected from the sample needs to be spontaneous and natural. The best way to achieve this is by collecting the data from large corpora. If this option is not

available, a face-to-face recording is fine too. This seems to be straightforward; however, the researcher needs to be attention to a number of issues here. First, the researcher should decide whether the study requires read material or spontaneous speech, monologue or dialogue, and whether recording nonsense words is adequate and enough to answer the research questions. Moreover, does the researcher need to record word lists, sentences or narratives? Every speech style has its specific pattern of stress and intonation which might affect the nature of the data. All of the above issues need to be addressed before starting the recording sessions. Failing to design the phonetic experiment and follow certain procedures will result in worthless results.

After carefully choosing the material to be recorded, the researcher needs to be aware of probably the most important issue in research in humanities "the Observer Paradox". In 1972, Labov introduced the notion of the observer's paradox. In its basic form, this notion means that people perform more naturally when they are not being observed. He states that "the aim of linguistic research in the community must be to find out how people talk when they are not being systematically observed; yet we can only obtain these data by systematic observation" (Labov 1972:209). There have some arguments which are not in complete support of this notion. Some researchers, for example (Gordon 2013) believe that instead of treating a recording session as a methodological issue, because of the observer's paradox, it is better to look for ways to minimize the effect of the presence of observer and the recording equipment. In other words, viewing a recording session as a limitation may inhibit researchers from conducting research. The best way is to record data as close and as natural to the source as possible. In this respect, different techniques can be used to divert the attention of the person being recorded away from the recording session. For example, the researcher should establish a friendly environment to make the recording as natural as possible. As Labov (1972) points out, by distracting speakers from the fact that they are being observed, they seem to forget that they were talking to a researcher in the presence of recording equipment. The researcher can also explain to the person being recorded that the aim of this recording is to analyse the language, not the way they speak. In addition, the researcher should give the speakers a couple of breaks to relax during the recording session. This is to make the participants relax

and to divert their attention from the fact that they are being recorded at the moment (Labov 1972: 92).

The final step that the researcher needs to take is to apply quality control. Oliveira et al. (2008) suggest that this step can be taken in two stages: while the recording and after the recording. While recording, the researcher can highlight some of the data that was not produced properly and ask the speaker to repeat it after the recording session or in another session. The second stage is during the analysis. If the researcher feels that there are some errors in the data, he should exclude this part of the data and ask the speaker to record the data again.

Conclusion:

This paper has detailed a number of methodological issues related to experiments in phonetics. The aim of this discussion is to help young phoneticians who are interested in working on LA in particular to construct a valid experiment when conducting a phonetic study on Libyan Arabic. The first issue is the physical state of the speakers to be recorded in the experiments. The researcher needs to pay attention to information about the physical character of the speaker such as his "age, gender and pathology. The age should be between 20 and 50, either males or females is fine, with no history of hearing impairment or loss, speech disorder, and no surgery in the vocal tract. The issue of speech disorder and hearing impairment will render the experiment as invalid and non-reliable. Information about the language background of the speaker is also equally important. Here, the researcher needs to check the speaker's first language, dialect, level of education and profession. The participants should be native speakers of the language under investigation, speaking a standard variety without any dialect mixing.

The second main issue investigated in this paper is how to obtain high quality speech recordings, and how to display it maintaining the same quality. The conclusion reached is that choosing excellent equipment for recording and displaying speech is very crucial. Using a professional solid-state recorder along with a super-cardioid pre-polarised condenser microphone should ensure a high quality recording. In addition, it is very imperative to follow some techniques and tips, as to how and where to record. The

recording session should take place in a very quiet and sound-proof room to guarantee obtaining the highest quality signal with no background noise. When all the above issues are taken into consideration, the phonetic experiment will reflect a systematic and interesting research and will guarantee that research in phonetics is precise, objective and valid. It will also lead to results that are reliable and can be generalized.

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