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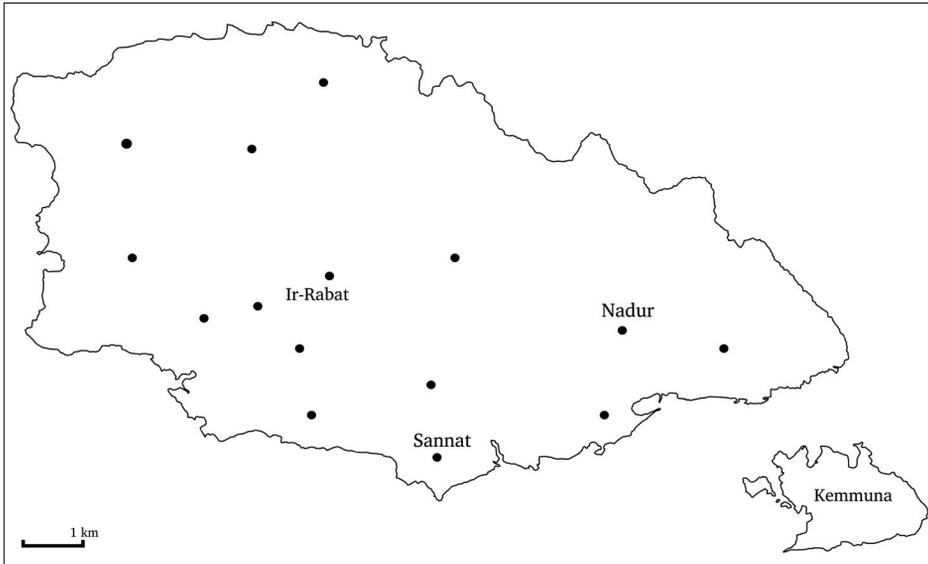
# The Acoustic Vowel Space of Gozitan Naduri and Sannati Dialects

**ABSTRACT** The focus of this study is to apply acoustic measurements and account for the quality of vowels present in the vowel system of two Maltese dialects of Gozo—Sannati and Naduri—in order to establish whether there are any acoustic differences between the vowels that are present in both dialects. The study is restricted to 13 phonemic monophthongs present in both dialects. The test items are five target words for every vowel. Each item was repeated five times in pre-designated sentences by six native speakers for both dialects. This paper presents evidence that the vowel inventory of these two dialects does not vary only phonologically but is also distinguished acoustically in most vowels.

**KEYWORDS** acoustics, field research, Gozitan, Gozo, Maltese, Maltese dialectology, phonetics, vowel

## 1 Introduction

Maltese is a language spoken by a few thousand people worldwide, the majority of whom live in its home country, Malta. Despite a relatively extensive body of linguistic research, particularly in the last decade, on all aspects of language including phonetics and phonology, most of the work carried out has focused on standard Maltese (henceforth SM). Research on phonetics and phonology such as the work of Aquilina (1981), Azzopardi(-Alexander) (1981, 2003) and Borg (1976, 1994) describes the sounds and the phonological processes present in Maltese from a diachronic and synchronic perspective. The established vowel inventory of SM is comprised of 11 vowels, of which six are short whilst the remaining five are long: [i:], [i], [ɪ:], [ɛ], [ɛ:], [e], [e:], [ɔ], [ɔ:], [ɔ̃], [u:]. Four vowels are differentiated only by vowel length, which in Maltese has a phonemic status. However, the limited literature on dialectal varieties of



MAP 1. Geographical position of Sannat and Nadur (copyrighted by M. Klimiuk).

Maltese has shown that, despite the small size of the country, varieties make use of different vowel systems and phonological inventories.<sup>1</sup>

This paper shows the detailed acoustic description of Sannati (SD) and Naduri (ND), two regional dialects present in Sannat and Nadur respectively (see Map 1). Both villages are present on the island of Gozo, Malta. The acoustic analysis aims at presenting whether there are differences between the acoustic properties of vowels present in both vowel systems. Auditory studies of ND (Said 2007) and SD (Farrugia 2010) have shown that both dialects make use of a bigger range of vowels than standard Maltese (SM) and the only phonemic difference between the two vowel systems is the /æ:/ vowel, which is present in SD but absent in ND, as shown in Figure 1.

Other differences are found in the number of diphthongs. In a similar pattern, SD and ND share the same diphthong inventory (/ɛw, ɛj, ɛj, ɔw, ɔj, ɔj/) except for the fact that SD has an extra diphthong /ɛw/. However, according to Said (2007), ND makes use of an extra two vowels that have diphthongal qualities, [ʔɪ] and [ɪʔ]. A comparative analysis shows that the [ʔɪ] vowel has the same phonological distribution as the diphthong [ɛj] in SD, whilst the [ɪʔ] vowel has a similar distribution of the [æ:] vowel in SD.

However, despite the relative similarity of the vowel and diphthong inventories, the two dialects make use of different phonological and phonemic processes in which these vowels and diphthongs occur. Table 1 above shows examples of the different vowel distributions of minimal pairs present in both dialects.

1 See, among others, the works of such authors as Incorvaja (2007), Said (2007), and Farrugia (2010).

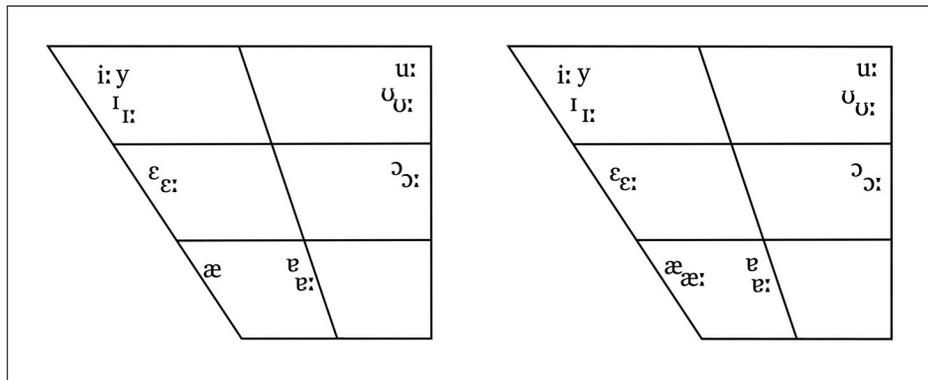


FIGURE 1. The auditory representation of the vowel phonemes of ND and SD dialects respectively.

Other differences in the phonological processes are found in the distribution of vowels or diphthongs present in a single-vowel word construction. In cases when the /e/ in SD is the only vowel present in a word, in ND in such an environment, one would find the vowel /ɔ/:

- /plɛt/ – /plɔt/ ‘plate,’
- /tʃɛt/ – /tʃɔt/ ‘flat,’
- /ɪmrɛt/ – /ɪmrɔt/ ‘I got sick,’
- /hɛt/ – /hɔt/ ‘I took.’

Diphthongs /ej/ and /ɛj/ in SD, shift to /ɔj/ and /ɛj/ respectively in ND, as in the case of:

- /bɛjt/ – /bɔjt/ ‘eggs,’
- /tʃɛjt/ – /tʃɔjt/ ‘jokes,’
- /bɛjn/ – /bɛjn/ ‘between,’
- /bɛn:ɛj/ – /bɛn:ɛj/ ‘builder.’

TABLE 1. Phonemic differences between SD and ND.

SM	ND	SD	Meaning
[bele]	[bele]	[bɛlæ]	‘stupid’ (adjective, FSG)
	[bele]	[bele]	‘sip’ (noun, FSG)
[de:ri]	[durɪ]	[dɔ:rɔj]	‘the past’ (noun, MSG)
	[deɛj]	[de:rɔj]	‘my back’ (noun, MSG + pronoun, 1 <sup>st</sup> person SG -i)
[ʔmi:s]	[ʔm <sup>3</sup> ɫs]	[ʔmɛjs]	‘shirt’ (noun, FSG)
	[ʔmɔjs]	[ʔmɔjs]	‘jumping’ (verbal noun derived from <i>qomos</i> ‘to jump’)

It has also been observed that in some nominal disyllabic words with a CVCVC construction where V is /e/ in SD, in ND it is /ɛ/, as in:

/bɛhɛr/ – /bɛhɛr/ ‘sea,’  
 /lɛhɛm/ – /lɛhɛm/ ‘meat,’  
 /nɛhɛl/ – /nɛhɛl/ ‘bees.’

Unfortunately, the frequency of occurrence and the influence of consonantal sounds and morpho-phonetic processes on these phonological processes is yet to be studied. On the other hand, they play an important part in the choice of target words chosen for the present study, as discussed below.

Due to the phonemic and phonological differences present in both dialects one would also expect to find a degree of acoustic differences between the two vowel inventories. However, in Gozo there seems to be an ‘inverse’ diglossic situation (Camilleri Grima 2008), where dialect is used both in formal and informal situations and speakers would continue using their dialect, commonly coined as ‘Gozitan’, despite being aware that there are linguistic differences that distinguish them (Casha 2006; Camilleri Grima 2008). In view of this situation, to what degree to SD and ND differ acoustically? Would two dialects with an almost identical vowel system and use vary from each other acoustically as well?

A specific acoustic difference is expected to be observed in the /æ:/ vowel present in SD and its phonemic counterpart in ND. These two phonemes are expected to behave differently as one is a near-front unrounded vowel whilst the other is a vowel with diphthongal behaviour. However, sentence repetition and speech contexts affect vowel quality differently and therefore differences are to be expected.

## 2 Method

A number of universal as well as language dependent factors were taken into consideration for the collection, extraction and analysis of data in order to answer the research question of this study. The methodology chosen is discussed in the sections below.

### 2.1 Participants

In order to limit variability and obtain a homogeneous and matching group of SD and ND participants, all participants chosen were native speakers of the dialects in question and were born and have lived most of their lives in the villages in

which these dialects are present. The selected participants were volunteers that completed a background questionnaire before the recordings took place for affinity purposes. If they met the requirements needed, they could participate for the study. The requirements were that they have lived most of their lives in the villages in question, that they had at least one parent who was a speaker of the same dialect, would not switch to standard Maltese with other speakers of a Gozitan dialect, are within the 40–55 age group and form part of the middle-working class.

In this way, six speakers from Sannat and six speakers from Nadur were selected. For each of these dialects, there was an equal number of male and female participants due to the different sociolinguistic variables and physiological properties of the vocal tract that both genders have, so that ‘gender dependence of the vowels could be investigated as easily as the dialect-dependence’ (Escudero et al. 2009: 1380). Despite the number of participants being relatively small, one has to consider the relatively small population of both villages in which these dialects occur.

## 2.2 Data collection

All 12 recordings were carried out in two different recording studios, one in Sannat and the other one in Nadur respectively, for sound quality reasons as well as to avoid any ambient noise. All sound files were saved in a *.wav* format for acoustic quality purposes. The initial 15 target vowels /i:/, /ɪ:/, /ɪ/, /ɛ/, /ɛ:/, /e/, /e:/, /æ/, /æ:/, /ɔ/, /ɔ:/, /ɒ/, /ɒ:/, /u:/ were orthographically represented to their phonologic Maltese Standard correspondents in a specific target word which was embedded in a pre-designated sentence. Five different target words were chosen for each target vowel, which was then repeated five times by each participant. This method ensured 25 occurrences for each vowel per participant.

Each target vowel was produced as a first vowel in a disyllabic sequence and was always in an accented position, except for vowel /æ/, which phonologically occurs only in an unaccented position in both dialects. The CV–CV construction was the preferred structure for the majority of the target words, but due to the different phonological processes and phonotactic rules present in the dialects, as discussed above, this word structure was not always possible. Out of the 15 target vowels, 6 of them (/ɛ/, /ɒ/, /y/, /æ:/, /ɔ:/, /ɔ/) do not phonologically occur in the desired structure. A pilot study showed that different articulatory and structural possibilities affect formant values. However, different structural possibilities did not considerably affect formant values as long as the syllable structure in which the target vowel occurred was the same in every target word. In the target words chosen, articulatory effects, due to the preceding consonantal sound, did not affect average formant values either. The target words chosen are shown below in Table 2.

TABLE 2. Target words used.

i:		ɪ:		ɪ		y	
CV-CV	ɦi:tæ 'sew it' pi:pæ 'pipe' pi:kæ 'rivalry' ri:ge 'ruler' ti:ʔæ 'window'	CV-CV	br:bæ 'door' br:dy 'they laid eggs' dɪ:tæ 'diet' ɦɪ:tæ 'he sew it' ʔɪ:dæ 'she is'	CV-CV	ɦɪtæ 'rain' br:kæ 'he cried' mɪtæ 'when' br:dæ 'he started' ɦɪdæ 'he served'	CVC	by:t 'pocket' ty:t 'blackberries' ɦy:ɦ 'stupid' ɦy:t 'fish' dy:t 'worms'
ɛ		ɛ:		ɛ		ɛ:	
CV-CV	dɛ:b:æ 'mare' dɛ:ʔsæ 'equally' pɛ:t:s:æ 'patch' ɦɛbzæ 'jump' ɦɛb:æ 'maiden'	CV-CV	dɛ:ræ 'appearance' dɛ:ɦæ 'chilling sensation' rɛ:ɦæ 'embarrassment' rɛ:dæ 'shaking' ɦɛ:dæ 'honeycomb'	CV-CV	bɛ:ɦɛ 'he stayed' ɦɛtɛ 'he cut' ɦɛbɛ 'hit' sɛbɛ 'seven' sɛtɛ 'he could'	CV-CV	sɛ:dæ 'until tomorrow' bɛ:tæ 'he sent her' rɛ:dæ 'lightning' ɦɛ:dæ 'position' ɦɛ:dɦæ 'thing'
æ		æ:				ɔ	
CV-CV	ɦɛ:dɦæ 'thing' br:dæ 'he started' br:kæ 'he cried' ku:dæ 'hair bun' pi:pæ 'pipe'	CVC	bæ:b 'door' bæ:t 'far' dæ:p 'he vanished' pæ:t 'foot-measurement'			CVC	pɔ:pi: 'poppy' tɔ:fi: 'toffee' pɔ:ti: 'potty'
ɔ:		ʊ		ʊ:		u:	
CV-CV	dɔ:k 'that' dɔ:n 'this' ɦɔ:r 'it spilled' dɔ:r 'house' tɔ:t 'she gave'	CV-CV	bɔ:ɦ:ɛ 'bulb' bɔ:t:ɛ 'joke' rɔ:t:ɛ 'route' sɔ:p:ɛ 'soup' bɔ:t:s:ɛ 'bulb'	CV-CV	bɔ:tɛ 'he suffered' dɔ:tɛ 'date' kɔ:kɛ 'cook' pɔ:ge 'wage' pɔ:pɛ 'poppe'	CV-CV	pu:pɛ 'doll' tu:tæ 'blackberry' ku:dæ 'hairbun' tu:bɛ 'tube' du:dy 'worm'

For each target word, a speaker had to read aloud, in dialect, a sentence presented in SM orthography. This method is not ideal due to being less true to natural speech, and poses a risk of influencing the speaker to hypercorrect himself or spontaneously switch to SM, as noted by Klimiuk and Lipnicka (2019). On the other hand, controlled speech ensures a more systematic approach and that the same number of occurrences would be collected from each informant. To the researcher's advantage, however, he himself is part of the Gozitan community and resorted to building a relationship with the speakers by speaking in dialect throughout the whole meeting in order to help speakers feel comfortable and carry out the task by staying true to their dialect pronunciation.

On the other hand, predesignated sentences were preferred to the repetition of the target words alone in order to ensure uniformity and avoid practice effects and other extra-linguistic factors that could affect formant values. Also, each target word was put in the middle of the sentence to avoid the rising or lowering of intonation patterns due to practice effects.

Picture aids were used to facilitate the process and avoid any difficulties in recognising what the target word is before switching to dialect.

### 3 Data analysis

Since data from all speakers could be analysed, there were a total of about 4500 tokens to be examined. However, some of the tokens were rejected due to the values being classified as outliers by R.<sup>2</sup> A visual interpretation of the mismatch of such tokens and the average formant value of the vowels in question confirmed the rejection. Formant values of vowel /y/ and /æ:/ were discarded following the fact that they rarely manifested themselves as monophthongs. An analysis on Praat, in fact, showed most of the time that these vowels occur either as monophthongs with diphthongal behaviour or as diphthongs.<sup>3</sup> Variations of /y/ were [y<sup>w</sup>], [i<sup>w</sup>], [yw] or [iw], while /æ:/ in SD occurred mostly as [ɪ<sup>3</sup>] as expected to happen in the case of ND.

Formant values were extracted manually on a digital spectrogram on Praat. The vowel nucleus (20–80 %) was considered whilst the starting points and end points of each vowel were discarded due to the co-articulation influence of the neighbouring consonantal sounds. These points offered a uniform and linear shape in spectrographic analysis. Segments were analysed for their F1, F2 and F3 values.

#### 3.1 Averages

The average values of the first three formants in Table 3 were made for the about 25 tokens of each of the 13 monophthong vowels for each speaker. The acoustic analysis of vowels is based on quantitative based formant data and is preferred to qualitative assessment. The computing averages below were measured on R and therefore the values below are affected by the different phonetic events as discussed above, especially in the case of /æ/ where formant values were elicited in an unstressed environment.

An overview of the cross gender acoustic average values shows that whilst gender is a main effect on formant values, there is a distinction between the male and female averages in ND and SD. Whilst in ND this difference is clear, in SD such distinction is not as marked as one would expect. F1 of male and female speakers of SD are very similar in all vowels. The biggest F1 difference is recorded in /e/ (70 Hz) whilst no difference is seen in the value of F1 in /ɔ/. Physiological differences are universal traits, however they vary from one language to another and there are also language dependent (Pépiot 2013).

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2 R: A Language and Environment for Statistical Computing. [www.r-project.org](http://www.r-project.org).

3 Praat: Doing Phonetics by Computer. [www.fon.hum.uva.nl/praat](http://www.fon.hum.uva.nl/praat).

TABLE 3. The mean values of F1, F2 and F3 of male and female speakers of ND and SD.

Dialect	Gender		[i:]	[ɪ]	[ɪ:]	[ɛ]	[ɛ:]	[æ]	[e]	[e:]	[ɔ]	[ɔ:]	[ʊ]	[ʊ:]	[u:]
ND	M	F1	308	399	341	548	551	553	624	667	515	507	420	391	351
	F	F1	323	445	368	694	676	656	748	848	602	623	473	427	371
	M	F2	2223	1767	2131	1622	1752	1464	1274	1311	1046	1017	1119	854	912
	F	F2	2599	2158	2560	1901	2025	1821	1488	1478	1263	1206	1304	919	1018
	M	F3	2949	2612	2735	2616	2682	2610	2500	2589	2304	2336	2403	2386	2308
	F	F3	3085	2948	3066	2936	2953	2928	2931	2945	2945	2981	3009	3009	3016
SD	M	F1	303	380	341	553	492	517	598	661	493	504	420	410	340
	F	F1	339	410	400	580	516	556	671	729	522	543	420	435	364
	M	F2	2352	1829	2223	1580	1841	1565	1366	1365	1005	1042	1011	864	853
	F	F2	2458	2040	2366	1806	2075	1764	1476	1463	1211	1261	1260	993	1067
	M	F3	3192	2598	2690	2626	2599	2542	2634	2617	2392	2404	2299	2425	2391
	F	F3	2985	2896	2939	2897	2908	2922	2896	2892	2922	2937	2972	2992	2925

## 4 Results

Data analysed was collected in a datasheet and tested on R. One-way ANOVA tests and their effect size ( $\eta^2$ ) were tested according to the independent variables of gender and dialect. Acoustic vowel spaces are also plotted on R according to their F1 and F2 mean values to avoid any superimpositions due to the large amount of data collected. Figures 2–5 below show 13 vowels per dialect, and not 15, due to the diphthongal realisations of /y/ and /æ:/ discussed above.

### 4.1 Analysis of results: Gender variation

Figures 2 and 3 below show the vowel plotting according to the gender of the participants. Gender variation was an expected universal variable due to physiological differences in their vocal tract between males and females despite such a difference not being big enough in certain incidences.

Vowel quality of male participants of ND and SD differed significantly in 6 out of the 13 vowels (front: /i:/, /ɪ/, /ɪ:/, /ɛ:/, /æ/; back: /ɔ:/) whilst in the case of female participants, significant variance was observed in 11 out of the 13 vowels (front: /i:/, /ɪ/, /ɪ:/, /ɛ/, /ɛ:/, /æ/; central: /e/, /e:/; back: /ɔ/, /ɔ:/, /ʊ/), showing that there are both inter-dialectal

and intra-dialectal differences in the dialects in question. The back vowels showed the least acoustical differences whilst significant variance is present in all front vowels. As for the central vowels /e/ and /e:/ no significant variance was recorded in the case of the male values whilst in the case of the female participants, significant variance was present in both vowels.

It has also been observed that female participants of both dialects make more use of the vowel space present in the vowel chart whilst the vowels of male participants are more restricted in terms of vowel space. Another distinction between male and female participants is observed in the front-back position of the vowels. The vowels of female participants present are in a more fronted position than that of the male counterparts.

The repeated measures by single-way ANOVA on vowel duration for both dialect and gender revealed a significant main effect on formant values meaning that it does not only show quantitative differences but also qualitative differences. The significant effect of vowel duration on vowel category for both dialects confirms such a statement. This qualitative difference between short vowel (SV) vs long vowels (LV) is consistent in all vowels where this dichotomy exists, except for the /ɔ/-/ɔ:/ distinction in male participants where only durational difference was observed (ND: F1: [F = 0.01, p < 0.91]; F2: [F = 4.80, p < 0.06.]; F3: [F = 2.13, p < 0.15]; SD: [F1: F = 2.07, p < 0.15]; F2: [F = 0.54, p < 0.46]; F3: [F = 0.33, p < 0.57]). To the contrary of what has been observed in the auditory studies of Said (2007) and Farrugia (2010).

Another important characteristic of vowel length is seen in the position of front and back vowels. For both male and female participants, the long vowels /ɪ:-/ɔ:/ have closer proximity to the long vowels /i:-/u:/ rather than to their short vowel counterparts /ɪ/-/ɔ/.

It has also been noted that vowel height of front and back vowels is symmetrical for both dialects. The F1 value of vowels /ɪ/-/ɔ/; /ɪ:-/ɔ:/; /i:-/u:/ is very similar. Such symmetry has been observed in vowel inventories having only a small number of vowels, whilst in varieties with bigger vowel inventories, especially Romance and Anglo-Saxon varieties, front vowels tend to have a higher F1 than their back vowel counterparts (Escudero et al. 2009). The two pairs which are not symmetrical are the half-open front vowels /ɛ/ and /ɛ:/ and the half-open back vowels /ɔ/ and /ɔ:/.

#### 4.1.1 Male participants

Front vowels of male participants, in fact, showed a more central position than expected (see Figure 2). Vowel /ɪ/ is, in fact, closer to the other front long vowel /i:/ than to its short counterpart /ɪ/, showing that vowel length is not only a quantitative factor in terms of duration but also qualitative. On the other hand, /ɪ/ is observed to have a closer front-back position, which is often associated with half-open front vowels. For half-open vowels /ɛ/ and /ɛ:/, in both SD and ND, /ɛ:/ has a more front a position than /ɛ/, which on the other hand, has a more central position. Vowel /æ/ is also shares



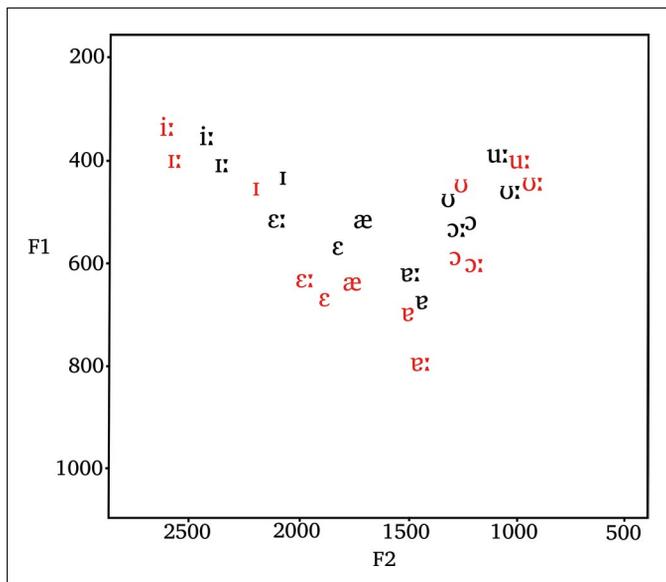


FIGURE 3.  
Vowel plotting of  
female participants  
of ND (red)  
and SD (black).

position on the chart, except for the two front vowels /i:/ and /ɪ/. On the other hand, the closed (/i:/, ɪ, ɪ:/) and mid-open (/ɛ, ɛ:/, æ/) front vowels of ND have a higher F2 value, and thus a more front position that those of SD, to the contrary of what happens in the case of the values of male participants, except for /ɛ/ and /ɛ:/ (see Figure 2).

A characteristic, which is similar to male participants, is the vowel position of the closed front and back vowels /ɔ:/ and /ɪ:/, which is closer to /u:/ and /i:/ rather than to their short vowel counterparts /ɔ/ and /ɪ/, which further confirms the assumption that vowel length influences vowel quality. Another similar characteristic is the more central position of mid-open front vowels /ɛ/ and /ɛ:/. However in ND, /ɛ:/ has a higher F1 value and its position is below its short counterpart /ɛ/ whilst in SD, the same vowel has closer proximity to /ɪ/ rather than to /ɛ/. The same vowel position can be observed in the formant plotting of the male speakers of Sannati. Another similar observable pattern of SD is that vowels /ɛ/ and /æ/ share the same vowel space, and the significant difference present in the ANOVA results (F1: [F = 6.53,  $p < 0.012^*$ ]; F2: [F = 5.22,  $p < 0.024^*$ ]; F3: [F = 0.25,  $p < 0.616$ ]) does not have an effect size large enough for vowel quality to be deemed as different (F1:  $\eta^2 = 0.04$ ; F2:  $\eta^2 = 0.03$ ).

The central open vowel /ɛ:/ of SD shares the same vowel space of vowel /ɛ/ of ND. ANOVA results show significant differences in both F1 (F = 5.58,  $p < 0.020^*$ ) and F2 (F = 6.57,  $p < 0.024^*$ ) but the test on effect size shows that the size, if different, is very small in both formants (F1:  $\eta^2 = 0.003$ ; F2:  $\eta^2 = 0.03$ ) to be considered as having different qualities.

Back vowels tend to differ from the values recorded for male participants. Out of the 5 vowels, no significant difference has been recorded for /ɜ:/ and /u:/ in ND and SD. On the other hand, it has been observed that in both ND and SD, there is only a marginal difference in the acoustic quality of /ɔ/ and /ɔ:/ in both dialects SD (F1: [F = 5.15, p < 0.025\*]; F2 [F = 9.08, p < 0.002\*\*]; F3: [F = 0.2465, p < 0.62]) and ND (F1: F = 4.46, p < 0.037\*]; F2: [F = 10.08, p < 0.001\*\*]; F3: [(F = 1.58, p < 0.210)). Also, whilst /ɔ:/ has a higher F2 value than /ɔ/ in SD, these values are reversed in ND. The same pattern is observed in the front-back position of /ɜ:/ and /ɜ/.

### 4.2 Dialectal variation

Figure 4 and 5 below show the vowel plotting of the male and female participants of SD and ND respectively. The vowel space for female and male participants is different in both dialects. Whilst both dialects show gender differences, it also shows that between-subject effects are present in both dialects. Vowel position of male and female participants is parallel in both dialects showing that both male and female speakers of the same dialect have vowel systems which are consistent despite the acoustic and statistical differences as discussed above. However, vowel positioning is different. A clear example is the /ɜ/ vowel of SD where the position of /ɜ/ vowels of male participants is close to the /ɜ:/ vowel of female participants, whilst this is not the case for ND.

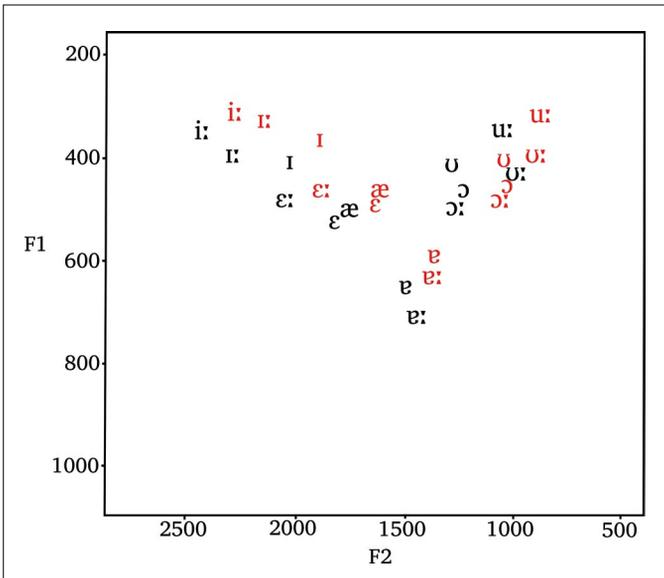


FIGURE 4. Vowel plotting of male and female participants of SD.

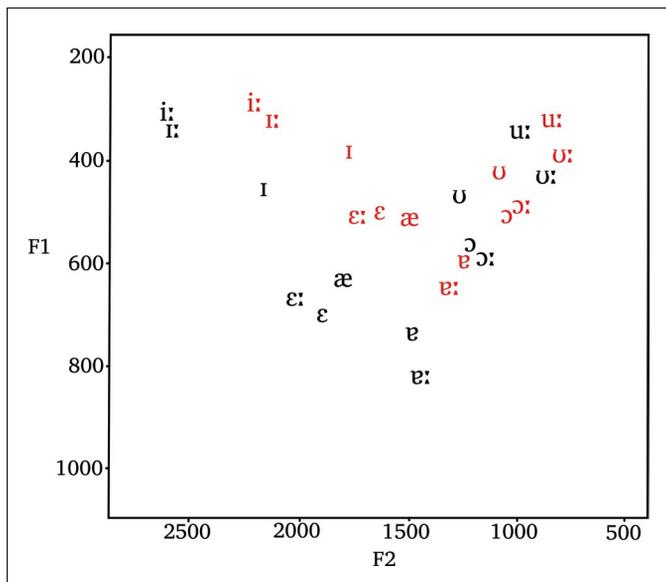


FIGURE 5.  
Vowel plotting of  
male and female  
participants of ND.

SD is more symmetrical than that of ND. The vowel systems of male and female speakers of SD are equidistant to each other, with the females' vowel system being more central. In the case of ND, the vowels systems of male and female participants make better use of the vowel space present in the vowels chart despite not being equidistant to each other, especially in the back vowels. The vowel system of females of ND is more central than that of male participants', as in SD.

#### 4.3 Vowels /y/ and /æ:/

The vowels /y/ and /æ:/, as mentioned above, both occur only in an accented position when present in a CVC construction. If an unaccented vowel is added to the CVC construction, both vowels change quality to /u:/ and /ɪ:/ respectively. The phonological process of /y/ to /ɪ:/ is the same for both dialects. However, in Said (2007) and Farrugia (2010) and the pilot study of the present study, it has been observed that both vowels do not always occur as monophthongs when present in an accented position. During the extraction of vowel formants, however, it has been observed that both vowels seldom occurred as monophthongs and in the instances where they presented themselves as such; there was not enough data for a quantitative study to be carried out. In fact, other allophones of the /y/ were [yʷ], [iʷ], [ɣyʷ] or [iʷ] for both dialects. On the other hand, the vowel /æ:/ presented the [ɪ<sup>3</sup>] variant. An auditory and acoustic observation showed that the Sannati dialect in fact did not present the [ɛ<sup>ɐ</sup>] variant as stated in Farrugia (2010) but the [ɪ<sup>3</sup>] just like in Naduri.

## 5 Conclusion

The study presents sociolinguistic, cross-dialectal and intra-linguistic concepts apart from an acoustic analysis of the vowels of two dialects. The study has shown that despite the Malta's small size, there are different dialectal varieties that differentiate themselves not only auditorily but also acoustically. This study does not only present the acoustic properties of vowels of SD and ND but also shows how their acoustic properties. Gender differences and phonetic variations, such as vowel length and vowel space between and within the two dialects, show that there are many acoustic components yet to be analysed in Maltese phonetics.

Despite the lack of local acoustic literature, the study has applied acoustic principles and measurements to what was previously known about the two dialects in question. This study did not only give new insights into how Maltese dialects differ on an acoustic level but has also given a better understanding of how future acoustic studies could be carried out. Future studies on vowel length and the realisations of vowels /æ:/ and /y/, for example, would give a better picture of the mechanisms that the different Maltese varieties use.

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