

# **Phon Application Manual**



# Introduction

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Phon is a software program that greatly facilitates a number of tasks related to the analysis of transcript-based and acoustically-measured speech data. Built to support research in phonological development (including babbling), second language acquisition, and phonological disorders, Phon can also be used for virtually all types of phonological investigations (e.g. loanword phonology, fieldwork in phonology, sociolinguistic studies). Phon supports multimedia data linkage, unit segmentation (e.g. utterance, word), multiple-blind transcription, automatic labeling of data (features, syllabification), and systematic comparisons between target (model) and actual (produced) phonological forms. Phon is also equipped with many facilities for data analysis, including query methods for phonology (e.g. phones, features, syllables, ...) as well as acoustic data.

Version 2 of Phon brings together two of the most important areas of empirical investigation in the area of child phonology, as it integrates transcript-based analyses of phonological data with the facilities for acoustic analysis provided by Praat. With this new version of Phon, and in addition to the functions listed above, the user can now:

- Import existing TextGrids into Phon sessions
- Generate TextGrids from existing Phon records
- Visualize TextGrids directly into Phon
- Send TextGrids to Praat for editing in a single click
- Run speech analysis functions directly from the Phon Query menu
- Export speech measurement data for further analysis

All of these functions are accessible through a user-friendly graphical interface. Databases managed within Phon can also be queried using a powerful search system adapted for the needs of the phonologist. This software program works on Mac OS X, Windows and Linux platforms and is compliant with the CHILDES ([TalkBank](#)) XML data format. Phon is being made freely available to the community as open-source software. Phon facilitates data exchange among researchers and is currently used for the elaboration of the shared [PhonBank](#) database, designed to support empirical needs of research in all areas of phonology and phonological development.

Current development of Phon and PhonBank is supported by the National Institute of Health. Earlier development of Phon was funded by grants from National Science Foundation, Canada Fund for Innovation, Social Sciences and Humanities Research Council of Canada, Petro-Canada Fund for Young Innovators, and the Office of the Vice-President (Research) and the Faculty of Arts at Memorial University of Newfoundland.

While it is impossible to name everyone who ended up being involved in one way or another in this project, we owe special thanks to a wonderful group of early adopters and beta testers, students and researchers alike, without whom it would have been much more difficult to produce the current software program. We are also grateful to Paul Boersma for this tremendous collaboration toward the interactions between Praat and related functions within Phon 2.

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# Chapter

# 1

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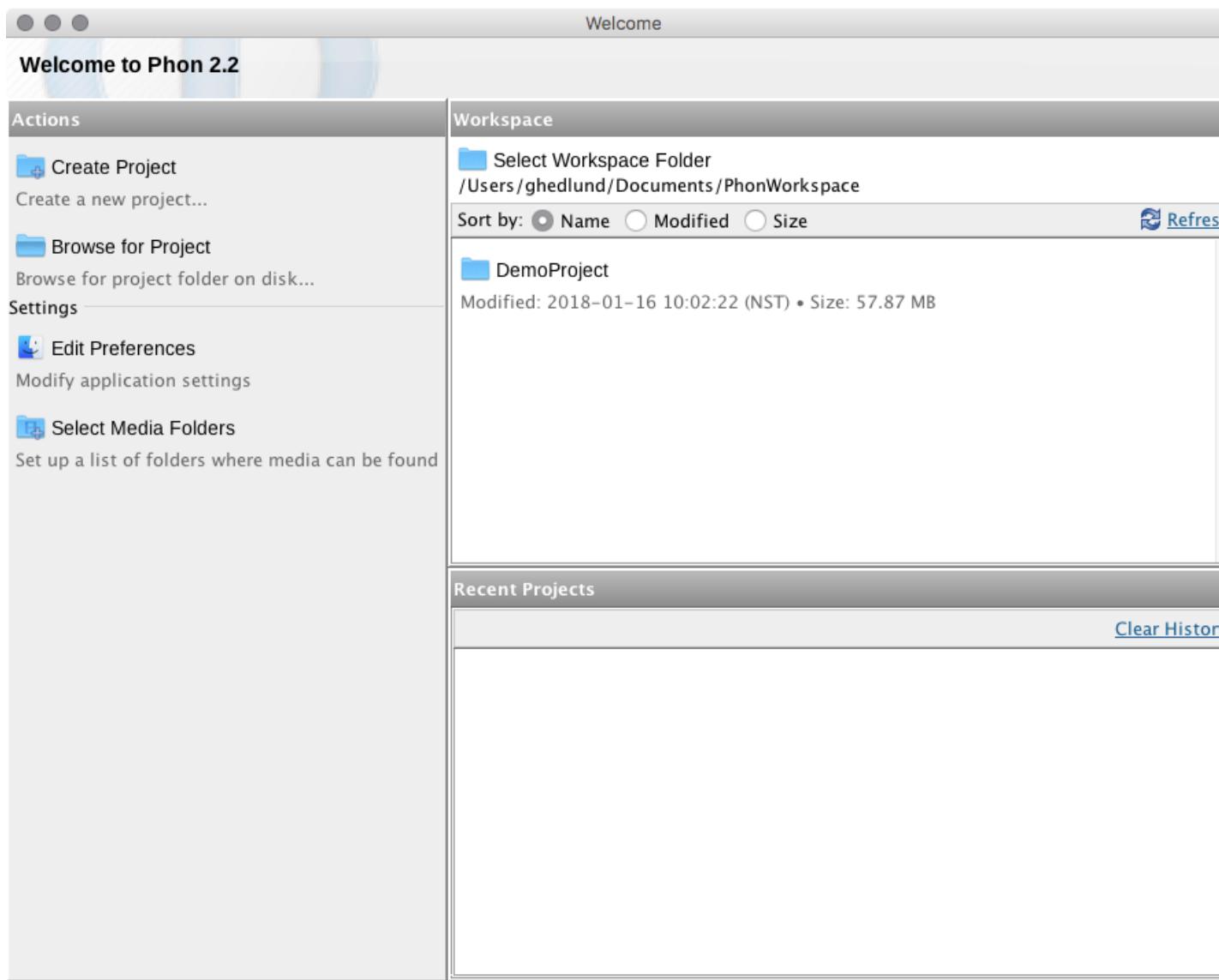
## User Interface

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**Topics:**

- *Welcome Window*
  - *Preferences*
  - *Project Manager*
  - *Session Editor*
  - *Tools*
- 

## Welcome Window



The *Welcome* window is the first window displayed when opening *Phon*. It is divided into three sections: Actions, Workspace, and Recent Projects.

### Actions

#### Create Project

Create a new *Phon* project.

From the **Workspace** window:

1. Click the **Create Project** button in the **Workspace Actions** pane.  
A text field will appear in which you can enter a project name.
2. If you do not wish to create a project at this time, click **Cancel create new project/X** or press **ESC**. Otherwise, type a name for your project and click the **Create new project in workspace/+** button or press **Enter**.  
This action will save the project in your current workspace folder and open it in the **Project Manager**.

#### Open Project

Open an existing *Phon* project.

From the **Workspace** window:

If the project is in your current workspace folder, click on it in the **Project List**, or right-click (CMD/CTRL +click) and choose **Open project** from the context menu. If the project is not in your current workspace folder, click the **Browse for Project** button in the **Other Actions** pane, locate the project using the resulting dialog and click **Open**.

The **Project Manager** window will appear.

 **Note:** If the project was created using an earlier version of *Phon* (and is a *.phon* or *.zip* file), you must extract the project before you can open it (see [Extract Project](#) on page 14 for instructions).

## Workspace

### Workspace Folder

The *Phon* workspace is the default location for *Phon* projects. Operations which are available from the **Welcome** window (such as creating, extracting, or archiving projects) affect files in the workspace folder. The default workspace folder is <userhome>/Documents/PhonWorkspace.

The workspace folder may contain a folder called '*backups*'. Compressed *Phon* projects are moved to this folder when they are archived or extracted from the workspace folder.

### Change Workspace Folder

Change the default workspace folder.

From the **Workspace** window:

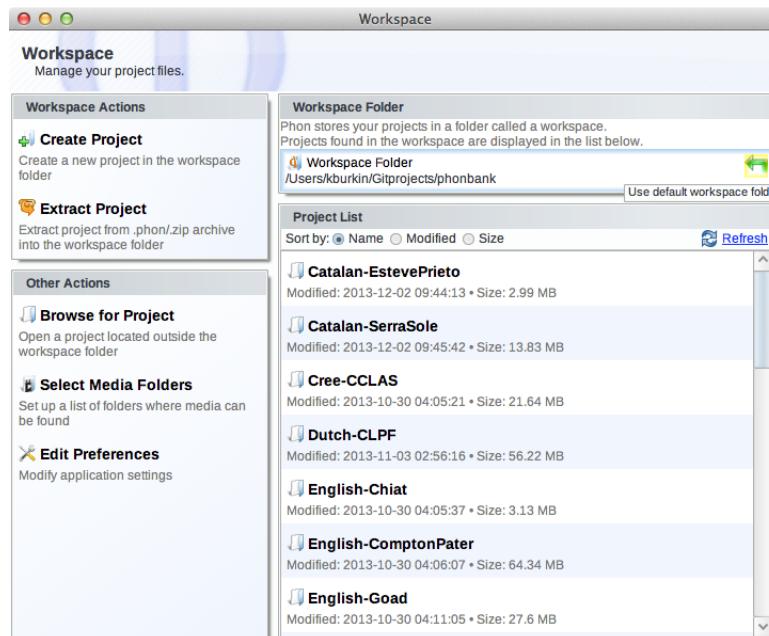
1. Click the specified folder name in the **Workspace Folder** pane.

A **Browse** window will appear.

2. If desired, click **New Folder** to create a new directory in the current location. Browse to the appropriate directory and click **Open**.

The chosen directory will be your new workspace folder.

 **Note:** To reset the workspace folder to its default location, mouse over the specified **Workspace Folder** and click the **Use default workspace folder** button on the right.

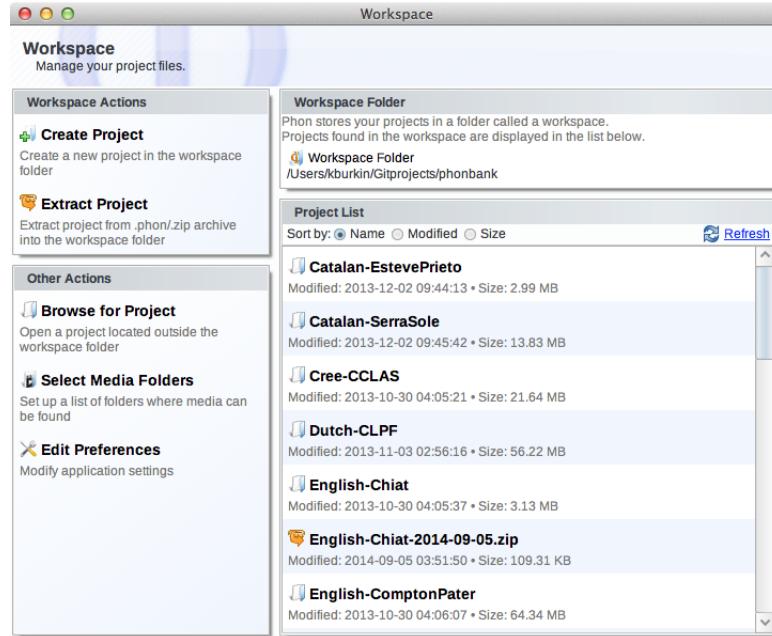


### Project List

The **Project List** pane displays the projects that are located in the current workspace folder.

This pane lists expanded projects (see [About Project File Structure](#) on page 17) with a folder icon next to them, and compressed projects with an orange arrow next to them.

Compressed projects may be expanded by clicking on them in the list, or by right-clicking (CTRL+click) and choosing **Extract project** from the context menu.

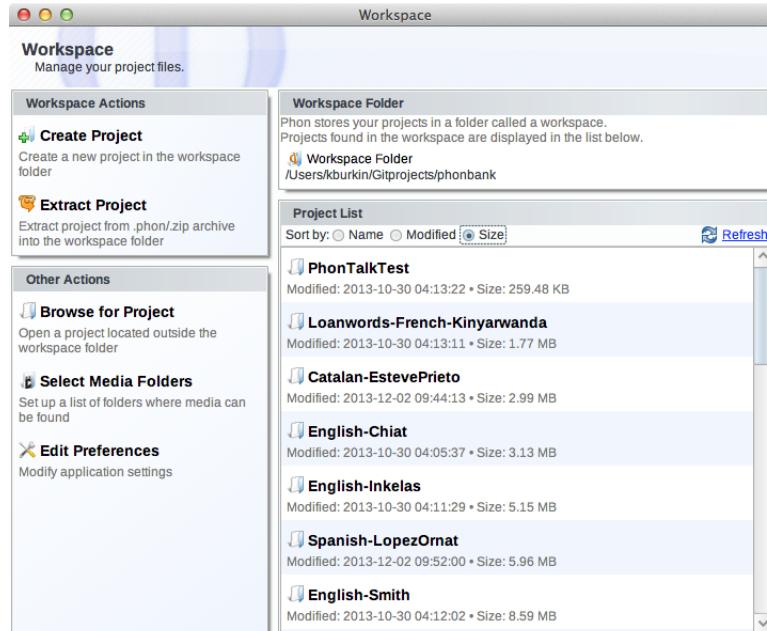


## Sort Project List

Sort the **Project List** in the **Workspace** window by name, date modified, or size.

From the **Workspace** window:

To sort the **Project List** by name, click **Name** in the **Sort by** field of the **Project List** pane. To sort by date modified, click **Modified**. To sort projects by their size on disk, click **Size**.



Your projects will appear in the **Project List** pane in the order specified.

- Note:** When sorting by name, projects that start with uppercase letters will be sorted before ones with lowercase letters.

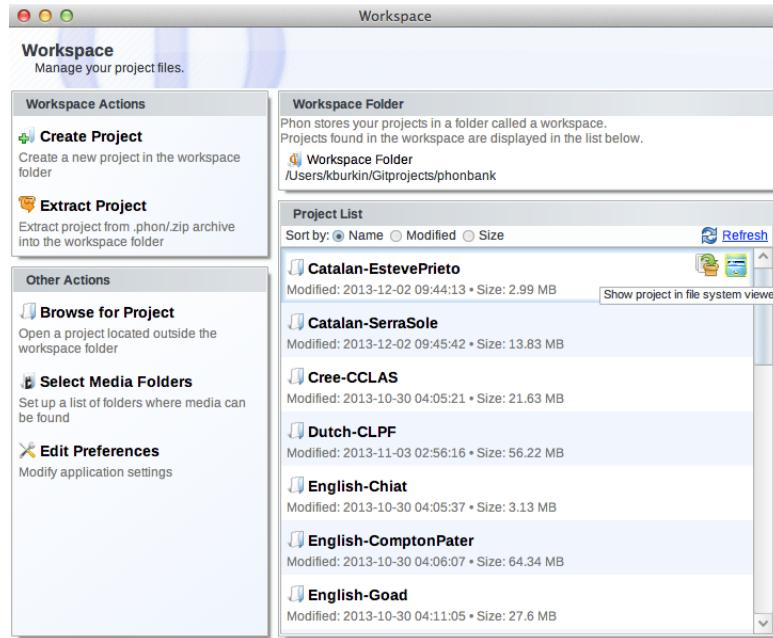
## Show Project in File System Viewer

Show a project's location using your computer's file system viewer.

From the **Workspace** window:

1. Mouse over the project you wish to archive in the **Project List** pane.

Two buttons will appear next to your project name; **Create .zip archive of phon project...** and **Show project in file system viewer**.



2. Click **Show project in file system viewer**. Alternately, right-click (CTRL+click) on your project and choose **Show project** from the context menu.

Your computer's file system viewer will open to the folder containing your project, which will be highlighted.

## Open Project

Open an existing *Phon* project.

From the **Workspace** window:

If the project is in your current workspace folder, click on it in the **Project List**, or right-click (CMD/CTRL +click) and choose **Open project** from the context menu. If the project is not in your current workspace folder, click the **Browse for Project** button in the **Other Actions** pane, locate the project using the resulting dialog and click **Open**.

The **Project Manager** window will appear.

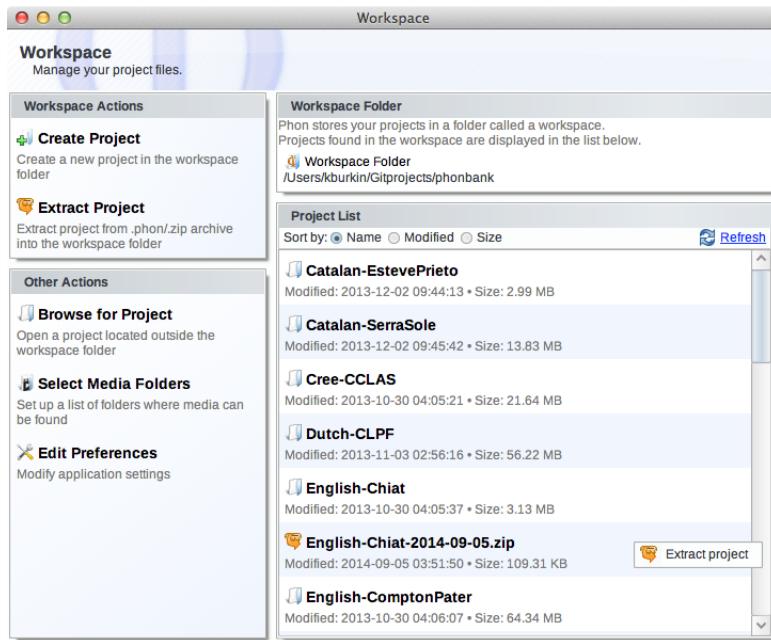
**Note:** If the project was created using an earlier version of *Phon* (and is a *.phon* or *.zip* file), you must extract the project before you can open it (see [Extract Project](#) on page 14 for instructions).

## Extract Project

Expand an old *.phon* or *.zip* project for use with the current version of *Phon*.

From the **Workspace** window:

Click on a compressed project in the **Project List** pane to extract it to a directory in your workspace folder, or right-click (CTRL+click) on it and choose **Extract project** from the context menu.



The project will be extracted to the workspace folder, and it will appear as an expanded (regular) project in the **Project List**. The original compressed project will be moved to the *backups* folder in your workspace.

-  **Note:** If the compressed project is not located in your current workspace folder, click **Extract Project** in the **Workspace Actions** pane, find and select the project in the **Browse** window, and click **Open**. This will extract the compressed project to your workspace folder. Original compressed projects extracted from locations outside the workspace folder will not be moved to the *backups* folder.

## Recent Projects

A second project list is displayed below the Workspace section of the *Welcome* window which displays a list of recently opened projects. A button to clear the recent project history is shown in the top-left portion of the list.

## Preferences

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Change *Phon* preferences.

1. From any *Phon* window, choose the **Edit > Preferences** (CMD/CTRL+,) menu item, or from the **Workspace** window, click the **Edit Preferences** button in the **Other Actions** pane. The **Preferences** dialog will appear.
2. From the **General** tab of the **Preferences** dialog, choose whether to **Check for updates when application starts** using the check box. You may also choose to re-enable any disabled information messages in the *Phon* interface by clicking **Reset Information Messages**.
3. From the **Session Editor** tab, you may change the settings for *Dictionary Language*, *Syllabifier Language*, and *Autosave Sessions* as you see fit.
4. From the **Media** tab, specify any default media folders you wish to use, following instructions in [#unique\\_14](#).
5. From the **Fonts** tab, change font sizes or options for different fields.
6. When you are finished editing preferences, simply close the **Preferences** dialog. If a session was already open before the preferences were changed, close and reopen that session in order to implement the changes.

## Autosaves

To prevent loss of data in the event of an unexpected shutdown, *Phon* has the option of auto-saving sessions at regular intervals. Session autosaves are named with the '\_\_autosave\_\_' prefix.

If an unexpected shutdown occurs and the user was unable to save changes to a session, the next time an auto-saved session is opened *Phon* will prompt the user to open the session in either its last user-saved state, or its last auto-saved state.

To use the auto-saved session as the main session file, open it and then save it.

To change the interval between autosaves, open the **Preferences** dialog. In the **Session Editor** tab, click on the menu in the **Autosave Sessions** field and choose the desired time interval.

To de-activate the autosave option, select **Never** as the autosave interval.

## Change Application Fonts

Change tier fonts and/or user interface (UI) fonts.

From the **F**onts tab of the **Preferences** dialog:

1. Click the font listed underneath each UI element to change it.  
The **Choose font** dialog will appear.
2. Choose the desired **Font** and **Size**, select **Bold** and/or **Italic** if required, then click **Ok**.  
The font displayed in **Session Editor** will reflect your choices.
3. Adjust size for all UI fonts using the slider.



**Note:** To reset default options for a UI element, mouse over that element and click the **Reset to default** button which appears on the right.

## Change Dictionary Language

Change the default **Dictionary Language** for use within sessions.

From the **Session Editor** tab of the **Preferences** dialog:

Click the **Dictionary Language** combo box and select the appropriate language.

## Change Syllabifier Language

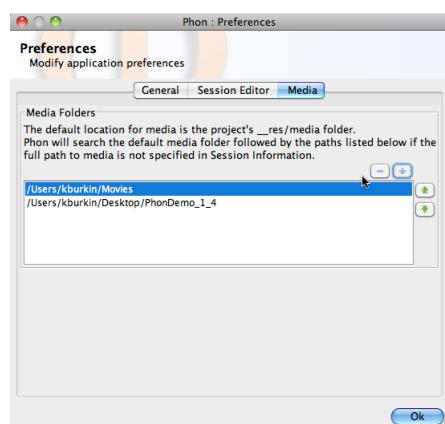
Change the default **Syllabifier Language** for use within sessions.

From the **Session Editor** tab of the **Preferences** dialog:

Click the **Syllabifier Language** combo box and select the appropriate language.

## Media Folders

A list of global *Media Folders* can be set using the **Media** tab of the **Preferences** dialog. *Phon* will look at each of these folders (in the order in which they appear) for media files.



The media folders can be internally structured to match *Phon*'s project/corpus layout. *Phon* will search the following locations for media (where <media> is the media folder defined in **Preferences**, <project> is the project name, <corpus> is the corpus name, and <session> is the session name):

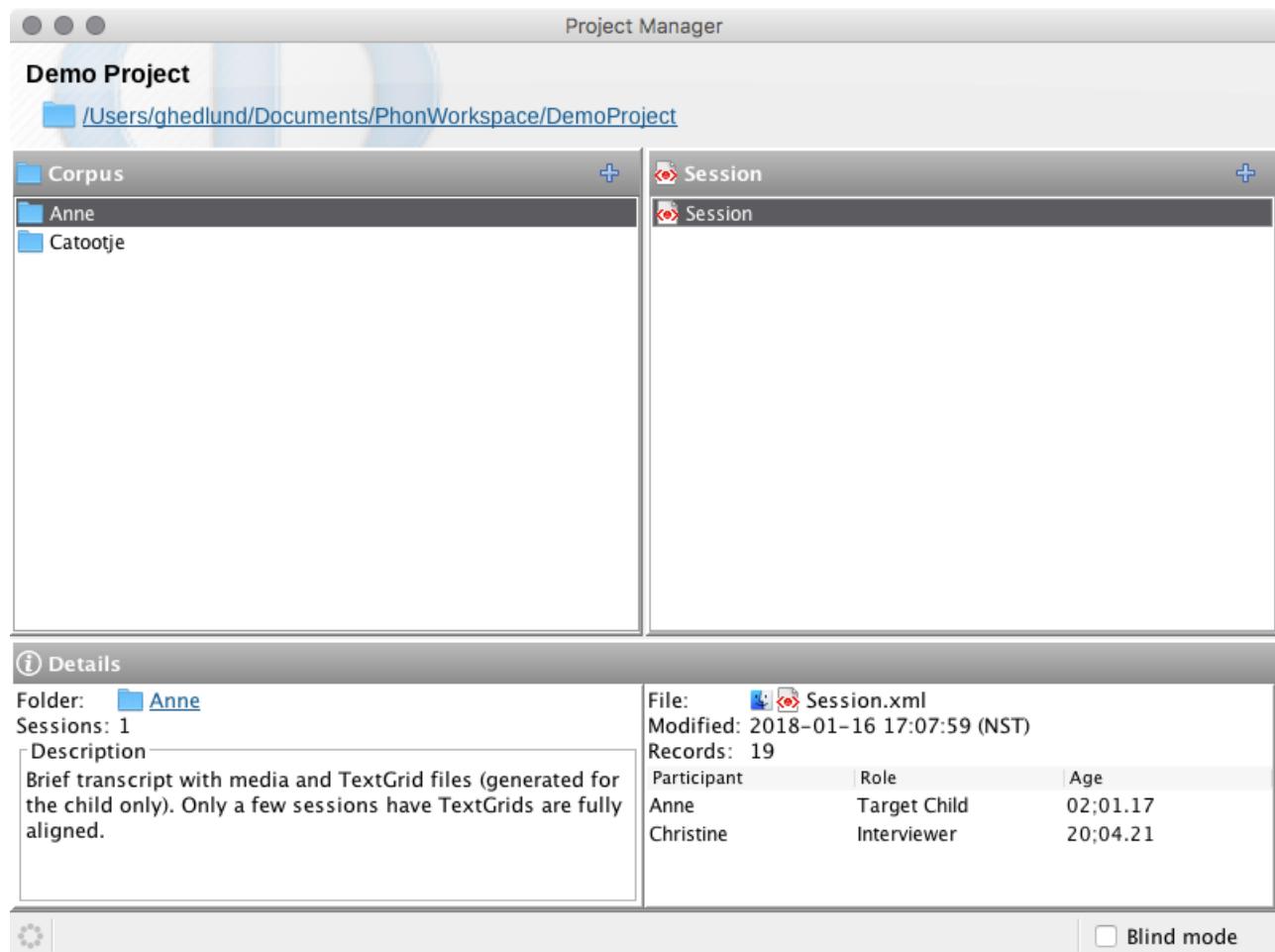
- <media>/<project>/<corpus>/<session>.[aif;avi;mov;mpg;mp4;wav;mp3;m4a;...]
- <media>/<project>/<session>.[...]
- <media>/<corpus>/<session>.[...]
- <media>/<session>.[...]

If the **Media** field in the **Session Information** view of the **Session Editor** has been manually changed:

- if the path is absolute (or fully-specified), the above rules are ignored and the media file is loaded from the specified path
- if the path is relative, the value of '<session>' above is replaced by the value in the media field.

## Project Manager

The *Project Manager* window is displayed when you open a project from the *Welcome* window or by using the **File** -> **Open** menu item.



## About Project File Structure

*Phon* projects are stored on a hard drive as directories.

The directory for each project will contain the following:

- A *project.xml* file which contains the information *Phon* requires for the project.
- A series of folders which correspond to each of the project's *corpora* (usually a collection of transcribed sessions for a specific target speaker).
  - Within each corpus folder are a series of xml files corresponding to each session. The xml files which are named beginning with '~' are session autosaves, created in order to prevent loss of data in the event of an unexpected shutdown.

The directory for each project may also contain the following:

- A project resources folder called '*\_\_res*', which is a system directory created by *Phon* to contain useful components for the project. This folder may contain:
  - A media folder, which is the default location for the media for the project and may contain media segments exported from *Phon*.
- A folder to contain saved query results, called '*\_\_search*'.



**Note:** Projects created using earlier versions of *Phon* may exist as *.phon* files. These projects will need to be extracted (i.e. expanded to directories using the **Workspace** window) to be used with the current version of *Phon*.

## Project Media Folders

A media folder may be assigned for a project and for each individual corpus in a project. The default media folder for a project is *\_\_res/media* inside the project folder. The default media folder for a corpus will be the project media folder. The search order for media files is:

1. Corpus media folder (if assigned)
2. Project media folder
3. Global media folders (see [Media Folders](#) on page 16)

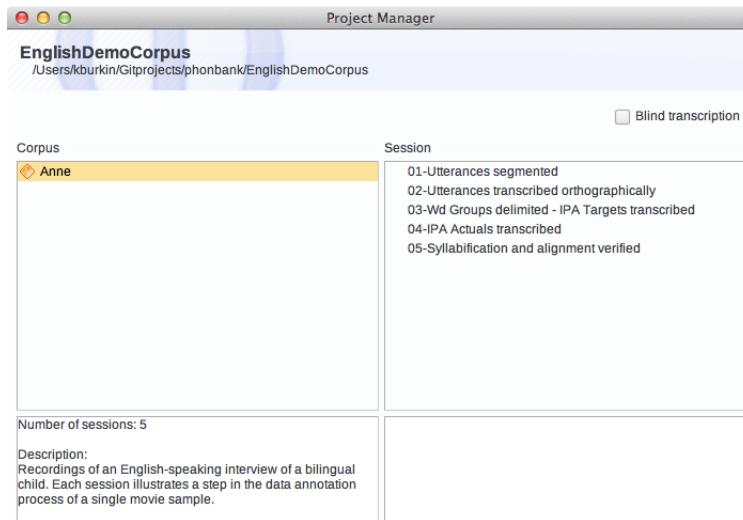
To assign project/corpus media folders, select **Project > Select project/corpus media folder...** from the **Project Manager** window. Context menu items are also available in the corpus and session list components.

## About Corpora

Within a project, individual transcripts (or *sessions*) are organized into a series of one or more *corpora*.

Each corpus typically contains a series of sessions relating to one specific participant in a study. The corpus may contain as many sessions as desired for that participant, spanning any length of time. This allows the user to easily search all transcripts relating to one participant, by searching within the relevant corpus.

When a corpus is selected, the number of sessions and a description of that corpus is displayed at the bottom of the list of corpora.



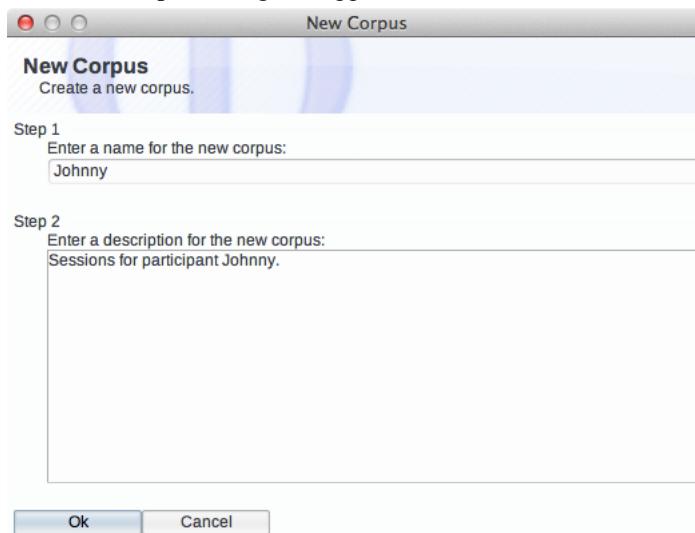
## Create Corpus

Create a new corpus in an existing project.

First, a project must be open.

From the **Project Manager** window:

1. Choose the **Project > New Corpus...** menu item.  
The **New Corpus** dialog will appear.



2. Enter a name (and optionally a description) for the new corpus. Click **Ok**.

This creates a new corpus with the specified name inside the open project. An error message will appear if a corpus with that name already exists.

 **Note:** You may return to edit the description at any time by clicking on the corpus name in the **Project Manager** and typing a description in the field below the *Corpus list*.

## Duplicate Corpus

Duplicate a corpus folder in your project.

From the **Project Manager** window:

Right-click (CTRL+click) on the corpus you wish to duplicate and choose **Duplicate Corpus** from the context menu.

The corpus folder will be duplicated with an integer suffix (e.g., '(1)') appended.

## Edit Corpus Template

Set default participants and tiers for all sessions to be created in a corpus.

From **Project Manager** window:

1. Right-click (CTRL+click) on the corpus whose template you wish to edit and select **Edit corpus template...** from the context menu.  
A **Session Template** window will appear for the selected corpus, showing the **Session Information** and **Tier Management** views.
2. Edit options as you see fit. Close this window when you are finished making changes.  
These settings will be applied to any sessions subsequently created within the corpus.



**Note:** For further instructions on how to specify information in the **Session Information** and **Tier Management** views, consult [Input Session Language](#) on page 36, [About Participants](#) on page 34, [Link Media to Transcript](#) on page 34, [Edit Tier Display Options](#) on page 38, and other related pages.

## Rename Corpus

Rename a corpus in your project.

From the **Project Manager** window:

1. Right-click (CTRL+click) on the corpus you wish to rename and choose **Rename Corpus** from the context menu.  
The **Rename Corpus** window will appear.
2. Follow the instructions in the **Rename Corpus** window. If you are unsure whether you want to rename your corpus, click **Cancel**. To continue and rename the corpus, click **OK**.  
You will return to the **Project Manager** window and the corpus will be renamed accordingly.

## Delete Corpus

Delete a corpus in your project.

From the **Project Manager** window:

1. Right-click (CTRL+click) on the corpus you wish to delete and choose **Delete Corpus** from the context menu.  
A dialog will appear asking you to confirm whether you would like to delete this corpus and informing you that this action cannot be undone.
2. If you are unsure, click **No**. To continue and delete the corpus, click **Yes**.  
The deleted corpus will no longer appear in the **Project Manager** window.

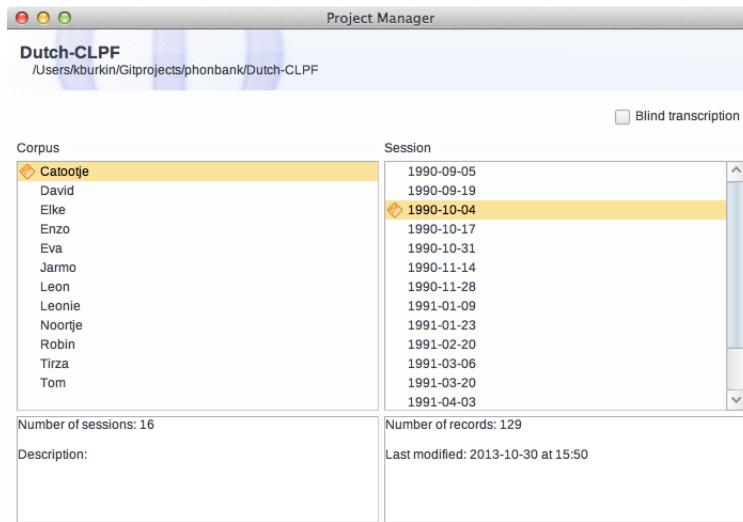
## About Sessions

A session in *Phon* is a transcript of a portion of field data targeting one or more participants in a project.

*Phon* is designed to facilitate the transcription of media recordings (audio or video) taken of participants in a study. As such, a *Phon* session usually corresponds to one media recording and the transcript of this recording.

A session is organized into a series of records which correspond to individual utterances.

Sessions can be viewed in the **Project Manager** window. When a session is selected, the number of records in that session and the date it was last modified are displayed at the bottom of the list of sessions.



## Create Session

Create a new session in an existing corpus.

A project with at least one corpus must be open.

From the **Project Manager** window:

1. Select the **Project > New Session** menu item, or right-click (CTRL+click) in the **Corpus** list. The **New Session** dialog will appear.
2. Enter a name for the new session, choose the destination corpus and click **Ok**. If you require a new corpus for the new session, click the plus sign to the right of the corpus selection field and enter the new corpus information as per the description at [Create Corpus](#) on page 19, and then select this new corpus as your destination. The new session will be created in the specified corpus and opened for editing. An error message will appear if a session with that name already exists.



**Note:** Each new session is created with an empty record at the beginning of it.

## Open Session: Default Mode

Open a session in the default mode.

From the **Project Manager** window:

Ensure that the **Blind transcription** box is deselected to open a session in default mode. Click the desired corpus, and double-click on the session that you would like to transcribe.

The selected session will open in the **Session Editor**.

## Open Session: Blind Transcription

Transcribe in multi-blind mode.

From the **Project Manager** window:

1. Select the **Blind transcription** check box and double-click on the session that you would like to transcribe. This will open a dialog prompting you to indicate whether you are a new or existing transcriber.
2. • If you are a new transcriber, choose the first option and enter your full name as well as a username. If you wish to use a password, select **Use password** and enter your chosen password into the two fields provided (the text in both fields must match). There is no password reminder function in *Phon*. Ensure that your password is memorable or store it in a safe location. Click **Ok** to continue.
- If you are a returning transcriber, choose the second option and select your username from the list. If you have chosen to use a password, you will be prompted to enter that password now. Do so and click **Ok**.

This will open the **Session Editor** window.



**Note:** Upon opening a session for the first time, there will be an empty record at the beginning of each session.

### Duplicate Session

Create a copy of a session within the corpus that contains it.

From **Project Manager** window:

Right-click (CTRL+click) on the session you wish to duplicate, and choose **Duplicate Session** from the context menu.

A duplicate of your session, with the suffix "(copy)" will appear in the **Project Manager**.

### Derive Session

Derive a new session using records from existing sessions.

From the **Project Manager** window:

1. Choose the **Project > Derive Session...** menu item.

A **Merge Sessions** dialog will appear.

2. Enter a **Session name** and Destination **Corpus** in the provided fields. Select one or more of the sessions for the split or merge and click **Next**.

The second page of the **Merge Sessions** dialog will appear.



**Note:** If you chose only one session, the selected records will be put into the new session. If you select more than one session, the selected records will be merged into a new session.

3. Select a session from the **Session** list at the left and choose whether to merge or split **All records**, a subset of **Specific records**, **Records for participant(s)** or **Records from Search results**. Repeat this process for all sessions in the **Session** list. Click **Next**.

This will begin the merging of the selected records/sessions.



**Note:** If you choose to merge only specific records, you will have to specify the relevant record numbers.

To specify several individual records, separate them with a comma and a space. To specify a range, separate the beginning and end record numbers with two periods and a space. If you choose to merge records for specific participants, you must select the participants from the list. If you choose to merge records from search results, you must select a past search from the list.

4. Once the *Session Merger shutdown* alert appears, click **Close**.

The newly derived session will appear in the specified **Corpus** in the **Project Manager**.

### Move Session

Move a session to a different corpus.

From **Project Manager** window:

Right-click (CTRL+click) on the session you wish to move, choose **Move Session To** from the context menu, and click on the corpus you wish to move your session to.

A dialog will appear asking you to confirm that you would like to delete the session from its original location. Click **Yes**. Your session will be moved to the selected corpus.



**Note:** You may move your session to a corpus within the current project, to another open project, or to any project in your workspace folder.

### Rename Session

Change a session name in your project.

From **Project Manager** window:

1. Right-click (CTRL+click) on the session you wish to rename, and choose **Rename Session** from the context menu.

The **Rename Session** window will appear.

2. Follow the steps in the **Rename Session** window and click **OK**.

You will be returned to the **Project Manager** window, with the session renamed.

## **Copy Session to Disk/Other Application**

Save a copy of a session to a location outside your project.

From **Project Manager** window:

1. Select the sessions you wish to copy in the **Project Manager** window.
2. Drag the selected sessions from the **Project Manager** window to a location on your host computer. (e.g., To the Desktop, an open folder in explorer/Finder, or an open application such as a mail client.)

## **Delete Session**

Remove a session from your project.

From **Project Manager** window:

1. Right-click (CTRL+click) on the session you wish to delete, and choose **Delete Session** from the context menu. A dialog will appear asking you to confirm that you would like to delete this session and informing you that this action cannot be undone.
2. If you are unsure, click **No**. To continue and delete the session, click **Yes**. The session will no longer appear in the **Project Manager** window.

## **Check Transcriptions**

Check sessions for phone transcription errors.

From the **Project Manager** window:

1. Select the **Project > Check Transcriptions...** menu item.  
This will open the **Check Transcriptions** window.
2. Select the **Check IPA Tiers** option.
3. Select the project, corpora, or sessions whose transcriptions you wish to check, and click **Next**. *Phon* will check each selected session, and any phone transcription errors will be printed in red, with their corpus, session, record number, and tier (*IPA Target* or *IPA Actual*).



**Note:** To resolve a reported error, return to the **Project Manager** window and open the session in which the error occurred, then navigate to the relevant record and visually check its IPA tiers.

## **Reset Syllabification**

In the event of display issues in *Target Syllables* or *Actual Syllables* in the **Syllabification & Alignment** view, it may be necessary to reset the syllabification of *IPA Target* and *IPA Actual* transcriptions.

From the **Project Manager** window:

1. Select the **Project > Check Transcriptions...** menu item.  
This will open the **Check Transcriptions** window.
2. Select the **Reset syllabification** option. To reset phone alignment as well, select the **also reset phone alignment** check box.
3. Choose an appropriate syllabifier by selecting it from the drop-down menu.
4. Select the project, or the corpora or sessions whose syllabification you wish to reset, and click **Next**. *Phon* will re-perform the syllabification for each selected session using the *Syllabifier Language* chosen in the **Preferences** dialog.



**Note:** After resetting syllabification or alignment, it will be necessary to visually verify these tiers.

## **Reset Phone Alignment**

In the event of display issues in the *Alignment* tier of the **Syllabification & Alignment** view, it may be necessary to reset the phone alignment of *IPA Target* and *IPA Actual* transcriptions.

From the **Project Manager** window:

1. Select the **Project > Check Transcriptions...** menu item.

This will open the **Check Transcriptions** window.

2. Select the **Reset phone alignment** option.
3. Select the project, corpora, or sessions whose alignment you wish to reset, and click **Next**. *Phon* will re-perform the alignment for each selected session.

 **Note:** After resetting syllabification or alignment, it will be necessary to visually verify these tiers.

## Refresh Project

Refresh **Project Manager** window to reflect changes.

From the **Project Manager** window:

Choose the **Project > Refresh** menu item or press F5.

## Import from CSV file(s)

Import a folder of CSV (comma-separated values) files into *Phon* as sessions.

The CSV import module can import a folder of CSV files with identical column formats into *Phon*. Where possible, CSV column labels should match *Phon* default tiers. *Phon* can automatically extract session date information from a CSV file if its name reflects its session date, in YYYY-MM-DD format.

From the **Project Manager** window:

1. Select the **Plugins > Import from CSV...** menu item.  
This action will generate a **CSV Import** window.
2. Click the **Browse** button to the right of the **Folder** field and locate the directory containing the CSV files for import. Also, ensure you select the proper **File encoding** option from the drop-down menu. Click the **Next** button.  
This action will prompt you to select files for import and the destination corpus.
3. Enter a corpus name in the **Destination Corpus** field and using the check boxes, select the files for import into that corpus. For each file, edit **Session Name** and **Session Date** as desired by double-clicking on either of them. Click the **Next** button.  
This will prompt you to set up the participants for that corpus: any participant information entered here will appear in all imported sessions for that corpus.
4. Click the **Add Participant/+** button at the right of the window. Enter participant name, sex, date of birth, language and other pertinent information in the appropriate fields and click **Ok**. To delete a participant from the import, highlight the participant in the table and use the **Delete/Backspace** key. Then click the **Next** button.
5. Set up column mapping such that each CSV column header has been assigned a tier name in *Phon*. To do this, highlight an item in the **CSV column** on the left, then use the drop down menu on the right to select the appropriate *Phon Tier* or enter a new tier into **Tier Name** field. You may also select the **Don't Import** menu item for columns that are repetitive or unnecessary. In the **Options** section, you may use the **Syllabifier** drop down menu to specify the correct syllabifier and the **Transcription filter** to convert the *IPA Target* and/or *IPA Actual* tiers from YAPA, SAMPA, IPAPhon or IPAkiel. Click the **Next** button.  
This action will activate the import.

 **Note:** If the column name in the CSV file is the same as a *Phon* default tier name, the CSV column will be automatically mapped to the appropriate tier in *Phon*.

 **Note:** If mapping a CSV column to the *Segment* tier in *Phon*, segments times must be listed in mmm:ss.uuu format (minutes:seconds:milliseconds).

6. Once the *Import finished* alert appears at the bottom of the **CSV Import** window, click the **Close** button.  
This action will return the user to the **Project Manager** window with the newly imported corpus. Each row from your CSV file will become one record in *Phon* with the tiers as specified.

After import, each CSV file should become a new session in *Phon*. The number of records in the session should match the number of rows in the CSV file (minus the header.) A file named *importsettings.xml* is also created in the source folder. If this file is present when the directory is selected in Step 1 the previous import settings are loaded (except for Syllabifier and Filter settings).

## Export to CSV file(s)

Export *Phon* sessions as CSV (comma-separated values) files.

The CSV export module can export *Phon* sessions into a specified folder as UTF-8 encoded CSV files.

From the **Project Manager** window:

1. Select the **Plugins > Export to CSV...** menu item.  
This action will generate a **CSV Export** window.
2. To select the destination folder for the export, click the **Browse for folder...** button to the right of the **Destination folder** field, locate the desired folder and click **Open**. Select the sessions you would like to export using the check boxes at the left of the **Sessions** list. Click the **Next** button.  
This action will prompt you to set up columns for the export.
3. To add a column to the export, type its name in the provided field and press **Enter** or click **Add column/+**. To remove a tier from the list, select it and click the **Remove Column/-** button. To export a tier which is not available in the existing list, type "**Tier:<tier name>**" in the provided field and click the **Add Column/+** or press **Enter**. Click on any tier name in the list and use the **up/down arrow** buttons to change the column ordering. Click the **Next** button.

This action will activate the export.

-  **Note:** The default column list for export includes: Session Name, Record #, and all default *Phon* tiers. The default can be restored by using the **Reset to default** button on the bottom right corner of the column list. This list of columns is saved after export and re-loaded the next time CSV export is opened.
-  **Note:** To export blind user transcriptions, add the tier "**IPA [Target|Actual] (<username>)**" (e.g. Tier:IPA Target (JSmith)).

4. Once the *Export complete* alert appears at the bottom of the **CSV Export** window, click the **Close** button. Session files for all corpora in the exported project will appear in the chosen directory with the format *Corpus name-Session name.csv*.

## Session Editor

---

### Session Editor - Keyboard Shortcuts

Editor keystrokes:

Command	Mac	Windows	Notes
Save	CMD+S	CTRL+S	
New Record	CMD+N	CTRL+N	The new record will be added after the current record in the session.
Cut Record	Shift+CMD+X	Shift+CTRL+X	The current record will be deleted and its contents will be copied to your system's clipboard.
Copy Record	Shift+CMD+C	Shift+CTRL+C	All tiers and tier content visible in <b>Record Data</b> will be copied to your system's clipboard.
Paste Record	Shift+CMD+V	Shift+CTRL+V	The most recently copied or cut record will appear as a new record at the current position in <b>Record Data</b> .

Command	Mac	Windows	Notes
Next Record	CMD+ ]	CTRL+ ]	
Previous Record	CMD+ [	CTRL+ [	
Last Record	CTRL+SHIFT+N	ALT+SHIFT+N	
First Record	CTRL+SHIFT+P	ALT+SHIFT+P	
Play Segment (Media Player)	CMD+R	CTRL+R	Only available when the external media player is open.
Play Segment/Selection (Speech Analysis)	Shift+CMD+R	Shift+CTRL+R	Only available when the waveform is displayed.
View IPA Chart	CMD+M	CTRL+M	

The following keystrokes are available when a tier is focused:

Command	Mac	Windows	Notes
Next Group/Tier	Tab	Tab	Will move the caret to the beginning of the next group or the next tier.
Previous Group/Tier	Shift+Tab	Shift+Tab	Will move the caret to the beginning of the previous group or previous tier.
New Group	CMD+G	CTRL+G	Creates a new group after the current (or end if no current group is focused.)
Merge Group	CTRL+ALT+G	CTRL+ALT+G	Merges the current group with the next group.
Split/New Group	CTRL+ALT+K	CTRL+ALT+K	Creates a new group at the caret position. Creates a new group at the beginning of the record if caret is at beginning of first group.
Delete Group	CMD+ALT+Shift+G	CTRL+ALT+Shift+G	Delete the current group.

## Records

### Add New Record

Add a new record to an existing session.

From the **Session Editor** window:

Display the record after which you would like to create a new record and click the **New record** button in the top left corner of the **Session Editor** or choose the **Session > New Record** (CMD/CTRL+N) menu item.

This will create a new record immediately following the selected record. The new record will be visible from the **Record Data** view.

### Copy Record

Copy all visible **Record Data** information to the clipboard.

From the **Session Editor** window:

Display the record you wish to copy and choose the **Session > Copy record** menu item (Shift+CMD+C). All visible tiers will be copied to the clipboard, with tier names and tier data separated by tabs. It can be pasted into the **Session Editor** as a new record, or into another window.



**Note:** When pasted into a word processor, you will likely be able to automatically convert the copied record into a table. Ensure that you use tabs to separate cells.

### Duplicate Record

Duplicate a record in an existing session.

From the **Session Editor** window:

Display the record which you would like to duplicate and click the **Duplicate record** button in the top left corner of the **Session Editor** or choose the **Session > Duplicate record** (CMD/CTRL+D) menu item.

This will create a duplicate record immediately following the original. The duplicate record will be visible from the **Record Data** view.

### Cut Record

Copy all visible **Record Data** information to the clipboard and delete current record.

From the **Session Editor** window:

Display the record you wish to cut and choose the **Session > Cut record** menu item (Shift+CMD+X).

All visible tiers will be copied to the clipboard, and then the record will be deleted. It can be pasted into the **Session Editor** as a new record, or into another window.



**Note:** When pasted into a word processor, you will likely be able to automatically convert the copied record into a table. Ensure that you use tabs to separate cells.

### Paste Record

Paste a record from the clipboard into the **Session Editor**.

From the **Session Editor** window:

Display the record after which you would like to paste, and choose the **Session > Paste record** menu item (Shift+CMD+V).

The record will be created in the **Session Editor** directly after the currently visible record.

### Delete Record

Delete a record from an existing session.

From the **Session Editor** window:

1. Display the record that you would like to delete and choose the **Session > Delete Record** (CMD/CTRL+E) menu item.

A dialog will appear asking you to confirm that you would like to delete this record and informing you that this action cannot be undone.

2. If you are unsure, click **No**. To continue and delete the record, click **Yes**.

The record will no longer appear in the **Record Data** view; the next record will be displayed.

### Navigate Between Records

Navigate between records in the **Session Editor** window.

1. To go to the next record in your session, select the **Session > Next record** menu item or click the **right arrow** at the top of the **Session Editor**.

Views will update to display information for the next record in your session, and the number of the currently visible record will be displayed.

2. To go to the previous record in your session, select the **Session > Previous record** menu item or click the **left arrow**.

3. To jump to the last record in your session, select the **Session > Last record** menu item or click the **right arrow with vertical line**.

4. To jump to the first record in your session, select the **Session > First record** menu item or click the **left arrow with vertical line**.
5. To navigate to a specific record using its number, click on the current record number and type in the desired number.

### **View Record List**

View a list of records in a session.

From the **Session Editor** window:

1. Click the drop down menu on the left of the **Search** bar and select **Open Record List**, or click within the empty **Search** bar and press **Enter**. Alternately, you may enter a search term in the **Search** bar and open a list of only records containing that term.

This will open the **Record List** view, which shows a list of the records in a session with their *Record #* and all tier information.

 **Note:** To arrange by a column, click on its header. To reorder columns, click and drag their header to the left or right.

2. Click on any record in the list to navigate to it in the **Session Editor**.

### **Sort Records**

Sort records in an existing session by start time.

From the **Session Editor** window:

1. Choose the **Session > Sort records...** menu item.

The **Sort Records** dialog will appear.

2. Click the **Sort by:** menu and select a tier by which to sort your records. For example, you may sort your records in chronological order (by choosing **Segment**), or alphabetically by their **Orthography**.

 **Note:** You may choose up to three tiers by which to sort your records; they will be sorted by the first chosen tier, and then records with the same information in the first tier will be sorted by the next chosen tier, and so forth.

3. By default, records will be sorted in ascending order. To sort in descending order by any tier, select **descending**.

4. When you have finished selecting sort options, click **Ok**. If you do not wish to sort records at this time, click **Cancel**.

The records for the current session will be sorted by the tier(s) you have chosen.

### **Search Within Session**

Run a quick search within your session and navigate to records containing results.

From the **Session Editor** window:

1. The **Search** bar is located in the top right portion of the **Session Editor** window. Click the drop down arrow on the left of the **Search** bar to choose options for your search, such as whether to **Include excluded records**, or **Case sensitive**.

2. Enter your search term in the **Search** bar.

A list of all records containing your search term in the specified search tiers will be displayed, showing the record numbers and tier data. If there are no results, this list will be empty.

 **Note:** To view a **Record List** generated from your search results, either press **Enter** with results visible, or click the drop down arrow on the left of the **Search** bar and select **Open Record List**. This will open a list of the search results in a new, undocked view. If no search terms have been entered, the **Record List** will contain all records in the session.

3. Click on a row in the search results or **Record List** to navigate to that record.

The **Session Editor** will navigate to the chosen record, and the list of search results will remain open.

4. To hide the list of search results, press **Esc**, and continue to use the **Session Editor** as per normal. To show the list again, click on the **Search** bar.

5. To clear the **Search** bar, click **Clear field/X**.



**Note:** Any **Search** options specified in *Step 1* will remain in place until they are manually changed or the session is closed.

## About Table Quick Search

In this type of search field, the following syntax is accepted:

```
[<column>(<column>)*:]<expr>(; [<column>(<column>)*:]<expr>)*
```

Possible elements:

- <column>  
The name of a column in the displayed table.
- <expr>  
Either a regular expression (regex), a phone sequence expression (phonex) or plain text.

Some example expressions:

**Table 1:**

Expression	Matches
b	Any row with a column that contains 'b'
Speaker:Anne; b	Any row where column 'Speaker' is 'Anne' and any other column contains 'b'
IPA Target:b{v}	Any row where the IPA Target column contains 'b' followed by a vowel
IPA Target,IPA Actual:k{v}	Any row where either the IPA Target or the IPA Actual column contains 'k' followed by a vowel
Orthography:c; IPA Target:{c}{g}	Any row where the Orthography column contains 'c' and IPA Target contains a consonant followed by a glide.

## About Editor Views

Information in each session is displayed in a series of small windows within the **Session Editor**, called views. There are several types of views:

1. Views with access/reference to the entire session:
  - **Session Information**
  - **Tier Management**
2. Views with information relating to individual records:
  - **Record Data**
  - **Syllabification & Alignment**
  - **IPA Validation**
3. Views with media functions:
  - **Media Player**
  - **Speech Analysis** (formally **Waveform**)
  - **Segmentation**
4. Views that allow you to search for text within a session:
  - **Find & Replace**
5. Utility views which help with IPA transcription:
  - **IPA Lookup**

To open a view, select it from the **View** menu. Functions for open views are available both within the views themselves, and in the **View** menu. To close a view, click the **Close/X** in the top right corner of that view or choose the **View > <view title> > Close** menu selection.

Not all views must be open at any given time, and views may be moved around within the **Session Editor** or "undocked" as their own separate window.

Views retain their currently defined size and position each time you exit *Phon*.

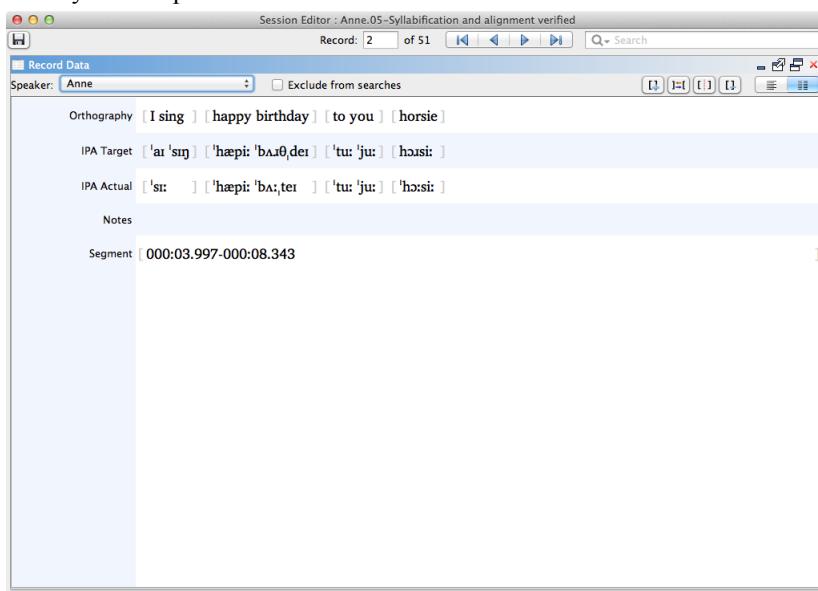
### Maximize View

Maximize a view within the Session Editor window.

From the **Session Editor** or an undocked view:

1. Click the maximize button near the top right corner of the view you wish to maximize, or when the view is focused, press **CTRL+M**.

If the view was docked, it will expand to fill the **Session Editor** window. If the view was undocked, it will expand to fill your computer screen.



2. To restore the view to its previous size, click the restore button near the top right corner (this button looks like two windows), or press **CTRL+N** when the view is in focus.

The view will return to its previous unmaximized position.

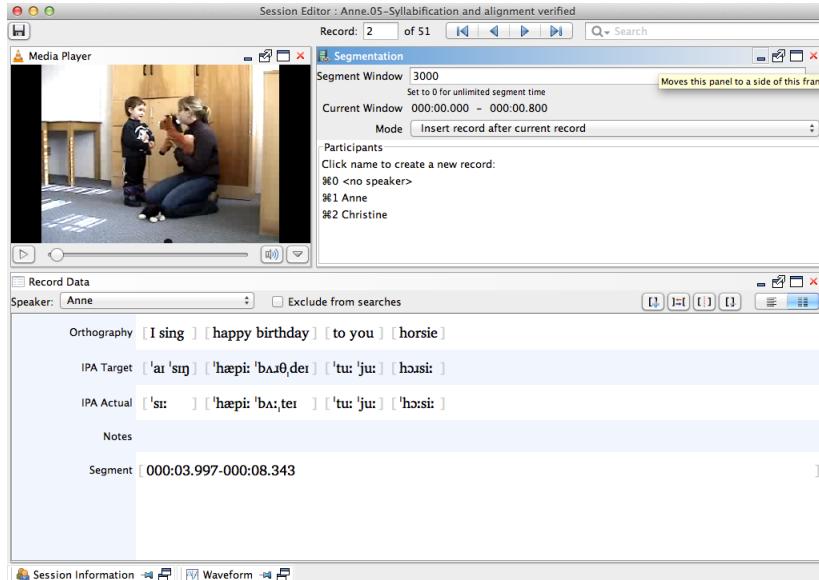
### Minimize View

Minimize a view within the **Session Editor** window.

From the **Session Editor** or an undocked view:

1. Click the **minimize/\_** button near the top right corner of the view.

A small title bar for that view will appear at an edge of the **Session Editor**.



- To make a minimized view temporarily reappear, click on its name or icon.

When the focus is changed to another view (i.e. another view is selected), the view will return to its minimized position.

**Note:** To make the view retain its opened position when focus is lost, click the thumbtack button near the top right corner of the title bar. To deactivate this option, click the thumbtack again.

- To restore the minimized view to a normal position within the **Session Editor** frame, click the restore button near the top right corner (this button looks like two windows), or press **CTRL+N** when the view is in focus. The view will return to its previous docked position in the **Session Editor**, even if it was undocked when you minimized it.

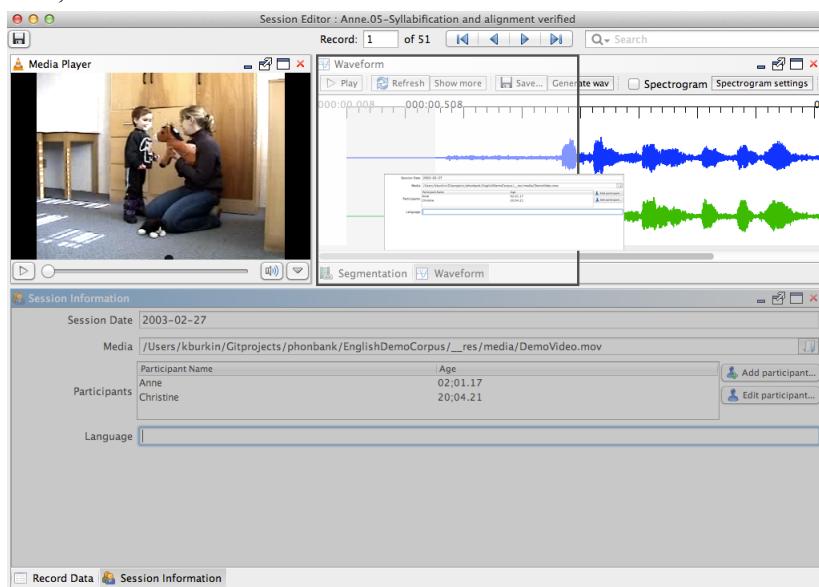
## Relocate View

Move a view to a new position within the **Session Editor**.

From the **Session Editor** window:

- Click on the view's title bar and drag it to the desired location within the **Session Editor** window.

As you drag the view, the **Session Editor** will show the alternate position of that view. When it appears as you wish, release the mouse button.



- Two or more views may occupy the same location in the **Session Editor**. To do so, drag and drop one view to the title bar of the other view.

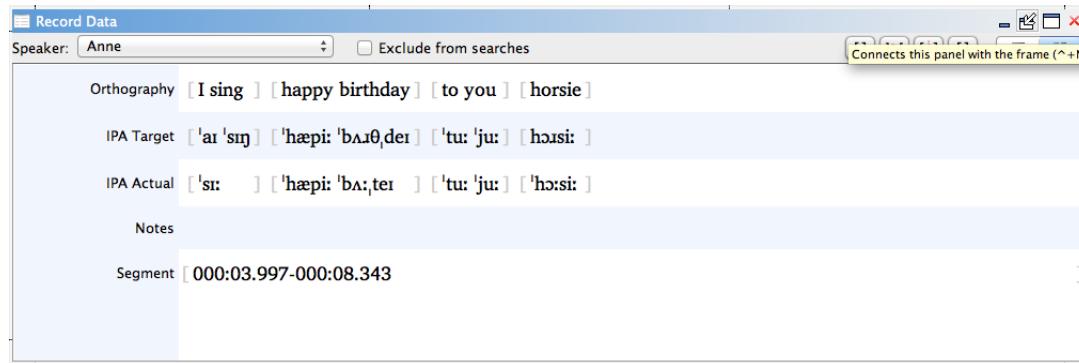
You can switch between views in the same position by selecting the appropriate tab at the bottom of either view.

### Dock View

Return an undocked view to the **Session Editor** window.

From the **Session Editor** window, with a view undocked:

In the top right corner of the view, click the button that looks like a window with an inward arrow (on mouseover it will say **Connects this panel with the frame**). Alternately, select the title bar of the view and press **CTRL+N**.



The view will reappear in the **Session Editor** window in its previous docked position.

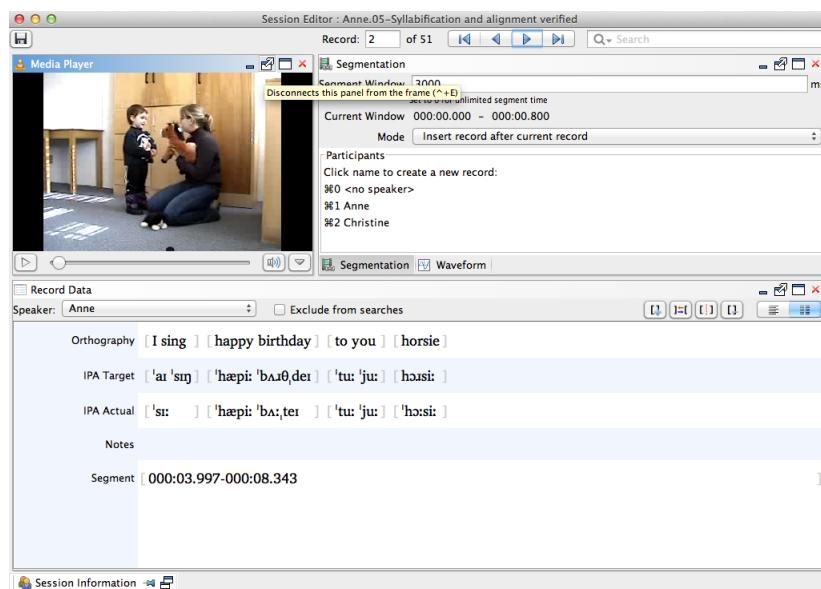
 **Note:** You may also click and drag the view's title bar to return it to the **Session Editor** window in a different position.

### Undock View

Disconnect or "undock" a view from the **Session Editor**, making it its own separate window.

From the **Session Editor** window, with the view you wish to undock open:

- In the top right corner of the view, click the button that looks like a window with an outward arrow (on mouseover it will say **Disconnects this panel from the frame**). Alternately, select the title bar of the view and press **CTRL+E**.



The view will appear as a separate window in front of the **Session Editor**.

- To move the view while it is undocked, click and drag on the small bar centred above the title bar. To resize the view, click and drag on any other edge or corner.

The view will retain its undocked size and position when you exit and reopen *Phon*.

## About Editor Layouts

The **Session Editor** has several built-in view layouts to assist users in session-related tasks.

The following layouts are available:

- **Default**

The default layout when you first open a session, corresponds to the **Segmentation** layout.

- **Find & Replace**

This layout facilitates searching and replacing terms across multiple records in a session. It includes the **Media Player**, **Find & Replace**, **Tier Management**, and **Record Data** views.

- **Segmentation**

Designed to facilitate media linkage and segmentation and other tasks in new sessions, this layout includes the **Media Player**, **Segmentation**, **Waveform**, **Record Data**, and **Session Information** views.

- **Syllabification & Alignment**

This layout facilitates manual verification of syllabification and alignment data in a session. It includes the **Record Data**, **Syllabification & Alignment**, and **Waveform** views.

- **Transcription**

This layout is designed to facilitate the transcription of records. It includes the **Media Player**, **Waveform**, and **Record Data** views; the **IPA Lookup** view is also included to streamline or automatize the transcription process.

- **Validation**

The **Validation** layout is designed for validating blind transcriptions. It includes the **Media Player**, **IPA Validation**, and **Record Data** views, with **IPA Lookup** and **Waveform** minimized at the bottom. Note that the **IPA Validation** view will not display blind transcriptions when in *Blind mode*, so that one user's blind transcriptions will not influence the other's.

- *User-defined layouts*

Any layouts which have created and saved by the user will be available at the bottom of the list of views.

- **Previous**

The previous user-defined layout is available here. User-defined layouts are automatically saved to **Previous** when the **Session Editor** window is closed.

### Save Current Layout

Save currently visible **Session Editor** layout for future use.

From the **Session Editor** window, with views arranged in desired format:

1. Click the **Select layout** button at the top left corner of the **Session Editor** window and choose **Save current layout...**, or select the **View > Save current layout...** menu item.  
A window will appear prompting you to give the layout a name.
2. Enter a name for the layout (usually reflective of the task you would use that layout to perform). Click **OK**, or click **Cancel** if you are unsure.  
The new layout will now be available in layout menus.

### Delete Saved Layout

Delete a user-created **Session Editor** layout.

From the **Session Editor** window:

1. Click the **Select layout** button at the top left of the **Session Editor** window and go to the **Delete layout** menu item, or go to the **View > Delete layout** menu, and select the layout you wish to delete.  
A confirmation dialog will appear, asking whether you wish to delete the layout.
2. If you are unsure whether you'd like to delete this layout, click **No**. Otherwise, click **Yes** to continue.  
The user-created layout will no longer appear in layout menus.

## Change to Preset Editor Layout

Quickly change the arrangement of views within the **Session Editor** to the default layout or to a previously saved layout.

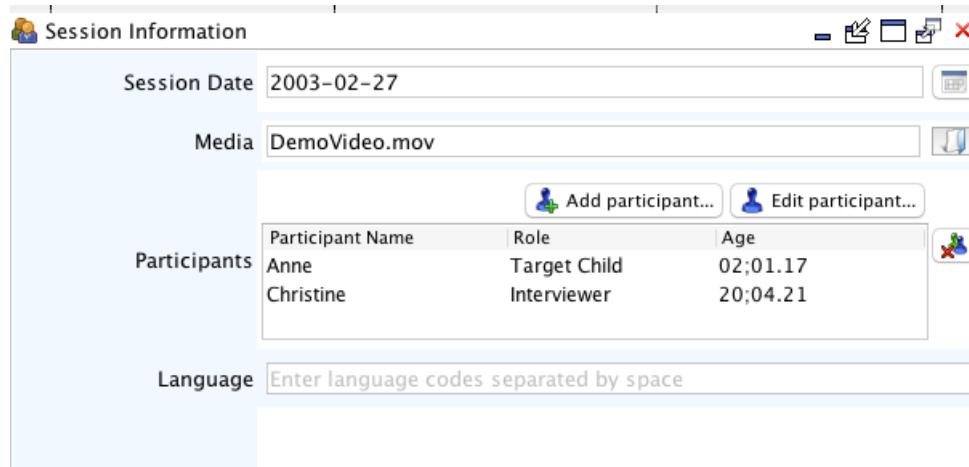
From the **Session Editor**:

Click the **Select layout** button at the top left of the **Session Editor** window, or go to the **View > Load layout** menu and select the desired layout.

The views in the **Session Editor** will move to reflect the chosen layout.

## View: Session Information

The *Session Information* displays and edits the session date, media file, participant list, and language list for the session.



### Edit Session Date

Edit a session's date to reflect the date of its associated media recording.

From the **Session Information** view:

Click on the existing **Session Date** and type the new date over it.

Participants' ages will be calculated using their birthday and the session date.

### Link Media to Transcript

Link a media file to the corresponding session.

From the **Session Information** view:

1. Click on the **Browse** button to the right of the **Media** field.

A **Browse** window will appear allowing you to search your file system for the desired media file.

2. Locate and select the media file and click **Open**.

This action will return the user to the **Session Editor**, from which the **Media File** will be available.



**Note:** The project resources folder is the default media location for an individual project ('*\_res/media*'). Placing your media in this folder allows you to keep your project's media within the project folder, and allows *Phon* to display the media's filename in the **Session Information** view without specifying the full path to it.

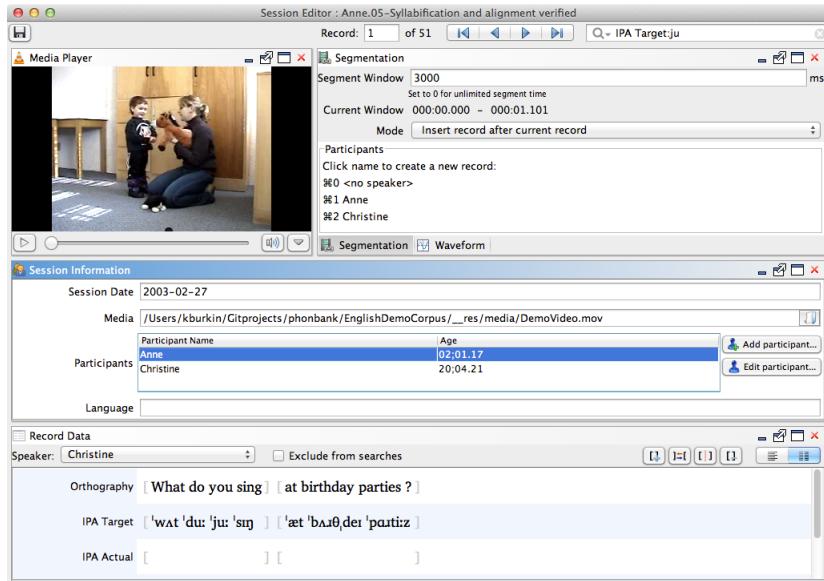


**Note:** You may set one or more default media folders in *Phon*. Media files stored in your default media folders can also be displayed without their full file path.

### About Participants

In the **Phon Session Editor**, the Participant(s) in a session may be specified and records may be associated with individual participants.

'Participant', in this case means a speaker in a research study. Often, only one target speaker is listed and transcribed as a participant in a session. However, there may be more than one target speaker per session, or it may be useful to have records that include the utterances of interlocutors for the purpose of establishing context for the target's utterances.



Associating an utterance with a speaker allows you to:

- study intra-speaker speech patterns and changes
- compare the patterns of multiple speakers
- compile several speakers' data together to make more generalizable observations.

Since a corpus often contains data mostly relevant to a specific participant, *Phon* allows users to specify one set of participants for an entire corpus, in what is known as a corpus template. See [Edit Corpus Template](#) on page 20 for instructions.

## Add Participant

Add a new participant to a session.

From the **Session Information** view:

- Click the **Add Participant** button at the right of the **Participants** field. The **Edit Participant** window will appear.
  - Enter the participants *Name, Birthday, Language, Group, Gender, Education* and *Role*. Click **Ok**.
- Note:** The age for each participant is calculated automatically based on the birth date and the session date. You must enter a birthday (or a best guess) such that the application will not calculate a negative age.
- Repeat Steps 1 and 2 for each participant.

## Edit Participant

Edit a participant for a session.

From the **Session Information** view:

- Select an existing participant's name and click the **Edit Participant** button to the right. The **Edit Participant** window will appear.
  - Edit the participant's **Name, Birthday, Language, Group, Gender, Education** and **Role** as you see fit and click **Ok**.
- Any changes to the participant's name or age will be reflected in the **Session Information** view.

## Input Session Language

The main language for each session can be specified in the **Language** field in **Session Information**.

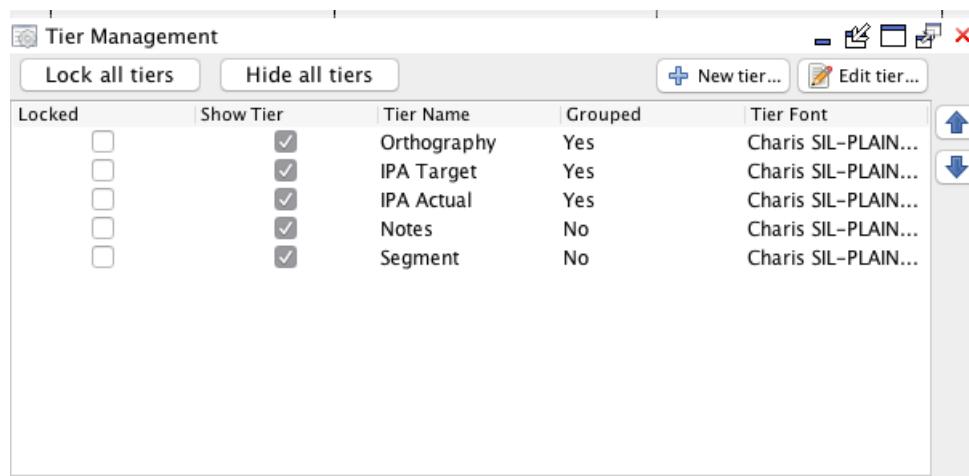
From the **Session Information** view:

1. Select the **Tools > ISO-639-3 Language Codes** menu item for a list of the ISO-639-3 language codes. This will bring up the **ISO-639-3 Language Codes** window, which displays a list of languages and language codes which you can look through.
 

 **Note:** By default, the list is organized by language code. To sort by language name, click on the **Language Name** column heading.
2. Find the desired language code. In the **Session Information** view, click in **Language** field and type language name or code.
 

 **Note:** The search field in the **ISO-639-3 Language Codes** is case-sensitive.

## View: Tier Management



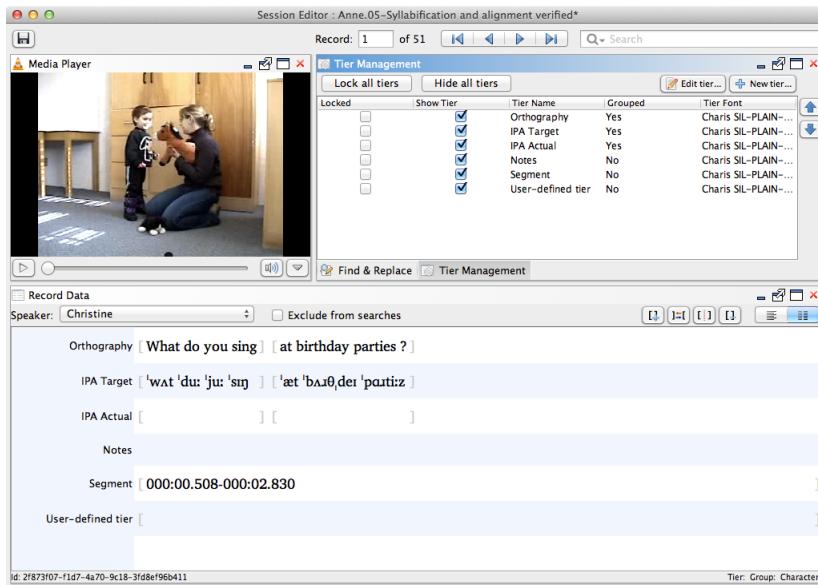
Locked	Show Tier	Tier Name	Grouped	Tier Font
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Orthography	Yes	Charis SIL-PLAIN...
<input type="checkbox"/>	<input checked="" type="checkbox"/>	IPA Target	Yes	Charis SIL-PLAIN...
<input type="checkbox"/>	<input checked="" type="checkbox"/>	IPA Actual	Yes	Charis SIL-PLAIN...
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Notes	No	Charis SIL-PLAIN...
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Segment	No	Charis SIL-PLAIN...

### Create User Defined Tiers

Create a new user-defined tier.

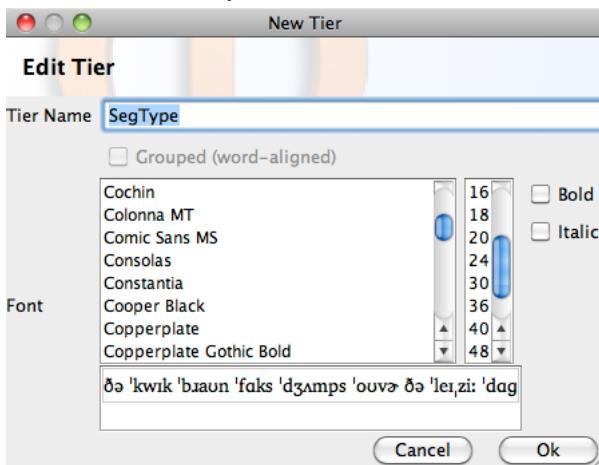
From the **Tier Management** view:

1. Click on the **New tier** button in the top right corner of the view. This action will generate a dialog prompting you specify details about the new tier.
2. Enter a name for the new tier. If the new tier should be a group aligned tier, select the **Grouped (word-aligned)** check box. Select an appropriate font for the new tier, or click the **Use default font** button to choose the default editor font. Click **Ok**. The new tier will show up at the bottom of each record.



3. To edit the font for a user-defined tier, select it from the list of tiers in the **Tier Management** view and click the **Edit tier...** button at the top right corner, or right-click on a tier and choose **Edit tier <tier name>**. Select the new font options and click **Ok**.

That tier will reflect your new font choice in the **Record Data** view.



**Note:** To reset the tier font to the default, right-click (CTRL+click) on the tier and choose **Reset font** from the context menu.

## Remove User Defined Tiers

Remove an existing user-defined tier.

From the **Tier Management** view:

1. Select an existing user defined tier and press **Delete** or **Backspace**, or right-click on a tier and choose **Delete tier <tier name>**.

This action will generate a dialog asking you to confirm that you would like to delete the tier and informing you that this action cannot be undone.

**Note:** Default *Phon* tiers (such as *Orthography*, *IPA Target*, *Notes*, etc.) cannot be deleted. If you do not wish to use one or more of these tiers, you can make them invisible following instructions at [Edit Tier Display Options](#) on page 38.

2. If you are unsure about removing the tier, click **Cancel**. If you would like to continue and remove the tier and all its contents, click **Ok**.

The user defined tier will no longer appear in the **Tier Management** or **Record Data** views for this session.

## Edit Tier Display Options

Select which tiers are visible in **Record Data** and change the order in which they appear.

From the **Tier Management** view:

1. Click on the check box to the left of each tier, under *Show Tier*, to select or de-select the tier for visualization. Selected tiers will be visible in the **Record Data** view, de-selected tiers will not be visible.
-  **Note:** To hide or show all tiers, use the **Hide all tiers/Show all tiers** button.
2. Select any tier which you would like to reorder and use the green up and down arrows to the right of the tier names to change its position within the list. The tiers will appear in the revised order in the **Record Data** view.
3. Repeat Step 2 for any tiers you would like to reorder.

## Lock or Unlock Tiers

Lock or unlock tiers against editing.

From the **Tier Management** view:

To lock a tier, select the check box to the left of its name under the *Locked* column. To unlock a tier, de-select the check box.

Selected tiers will be locked against editing in the **Record Data** view.



**Note:** To lock or unlock all tiers, use the **Lock all tiers/Unlock all tiers** button.

## View: Record Data

The record data view displays tier data for the current record.

The screenshot shows the 'Record Data' window with the following details:

- Header:** Record Data, Speaker: Anne, Exclude from searches, various toolbar icons.
- Tiers:**
  - Orthography:** [ OI sing ] [ happy birthday ] [ to you ] [ horsie. ]
  - IPA Target:** [ 'sɪŋ ] [ 'hæpi: 'bʌθ,deɪ ] [ 'tu: 'ju: ] [ hɔːsi: ]
  - IPA Actual:** [ sɪŋ ] [ 'hæpi: 'bʌθ,teɪ ] [ 'tu: 'ju: ] [ 'ɔːzi: ]
  - Notes:** [ ]
  - Segment:** [ 000:03.997-000:08.343 ] [ ▶ ]
- Bottom Bar:** Id: 49fe8d9a-7e0f-40d9-8431-26d3e8b6b8c2, Tier: Group: Character.

## New Group

Add a new word group to a record.

From the **Record Data** view:

1. Position the cursor in the *Orthography* tier within a group.
  2. Click the **New record after current** button in the **Record Data** view, or select the **View > Record Data > New record after current** (CMD/CTRL+G) menu item.
- A new group will be created after the current group.

## Merge Group

Merge multiple word groups into a single word group.

From the **Record Data** view:

1. Position the cursor inside a group in the *Orthography* tier which you would like to merge with a following group.
2. Click the **Merge group with next** button in the **Record Data** view, or select the **View > Record Data > Merge group with next** (OPT/ALT+G) menu item.  
The adjacent groups will be merged into a single group, with a space between the original contents.

## Split Group

Split the contents of a group.

From the **Record Data** view:

1. Position the cursor inside a group in the *Orthography* tier where the group should be split (at or after a space between words).
2. Click the **Split group** button in the **Record Data** view, or select the **View > Record Data > Split group** (OPT/ALT+K) menu item.

The group data will be split into two separate groups. If only one word was present in the group, an empty preceding group will be created. Only data in the *Orthography* tier will be divided. Other grouped tiers may require manual editing.

## Delete Group

Delete a word group.

From the **Record Data** view:

1. Position the cursor inside a group in the *Orthography* tier that you wish to delete.
2. Click the **Delete current group** button in the **Record Data** view, or select the **View > Record Data > Delete current group** (OPT/ALT+Shift+CMD+G) menu item.  
The selected group will be deleted, including all data in aligned groups.

## Exclude Records

Exclude selected records from queries.

From the **Record Data** view, with the record you wish to exclude focused:

Select the check box to the right of the speaker's name.

When running a query, this record will be excluded from the search.

 **Note:** To include previously excluded records in a session level query, from the **Query** view, select the **Include excluded records** check box.

## Transcribe Data

Transcribe data from the media file.

With the **Media Player** open, from the **Record Data** view:

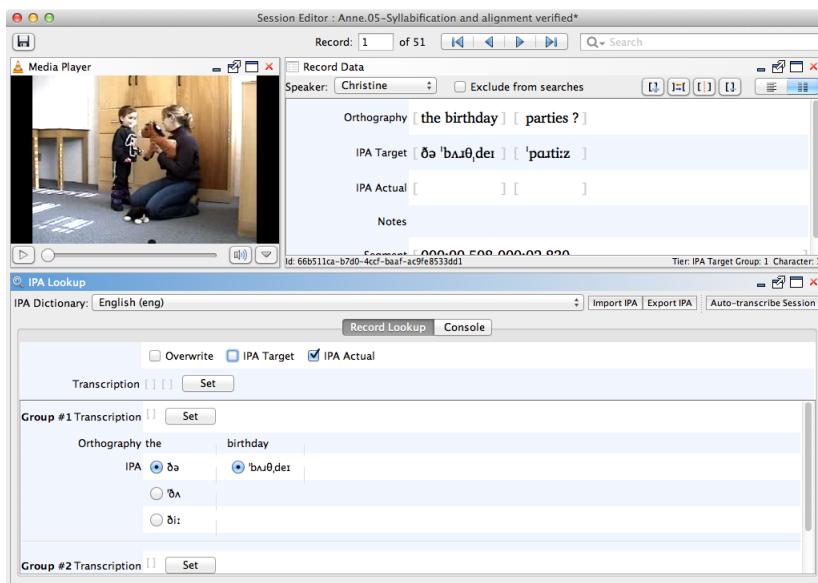
1. Click on the play button to the left of the *Segment* tier (CMD/CTRL+R) and type or use the **IPA Map** to enter the utterance into the *Orthography* tier.
2. Click on the *Orthography* tier and add word groups for each word by clicking **New group after current**.  
This will generate corresponding word groups in the *IPA Target* and *IPA Actual* tiers as well as any other group-aligned tiers.
3. If you wish to use built-in dictionaries of pronounced forms, select the **View > IPA Lookup** menu item.  
Otherwise, type or use the **IPA Map** to enter the *IPA Target* and *IPA Actual* transcriptions into the fields with the same name.

If you use **IPA Lookup**, a new view will appear with two tabs: **Record Lookup** and **Console**. **Record Lookup** is focused by default.



**Note:** To change dictionary language, click on the **IPA Dictionary** menu in the **IPA Lookup** view and select desired dictionary (listed by ISO-639-3 Language Code, see [Input Session Language](#) on page 36 for instructions for viewing the codes list). Language preferences may also be changed in the **Preferences** dialog.

4. In **Record Lookup**, choose whether to **Overwrite** existing transcriptions, and select whether to transcribe **IPA Target** or **IPA Actual** by clicking on the check boxes.
  5. Click **Set** to the right of the utterance in **Record Lookup** to transcribe the record as shown, or click the **Set** button next to an individual group to transcribe only that group.  
The selected transcription will appear in the *IPA Target* and/or *IPA Actual* tiers.
- Note:** If there is more than one transcription available in the selected dictionary for a word, there will be multiple entries listed in the **Record Lookup**. Select the desired transcription by clicking on it before you **Set** the group or utterance.



6. You may further modify any transcriptions in the *IPA Target* and *IPA Actual* fields by typing or using the **IPA Map**.

## About Boundaries and Pauses

There are three types of boundary markers that are supported in *Phon* transcriptions:

**Table 2: Boundary Markers**

Character	Name	Meaning
.	Dot	Syllable boundary
Space		Word boundary
+	Plus	Compound word

If there is a noticeable pause in the transcribed utterance, these transcription codes are also available:

**Table 3: Pauses**

Code	Meaning
(.)	Short pause between words
(..)	Medium-length pause between words

Code	Meaning
(...)	Long pause between words
^	Pause within a word

## View: Syllabification & Alignment

The screenshot shows the 'Syllabification & Alignment' view in Phon. At the top, there's a toolbar with icons for file operations and a 'Syllabifier Settings' button. Below the toolbar are three rows of syllable structures:

- Target Syllables:** Contains segments: s, i, n̩, h, æ, p, i:, b, ʌ, ɹ, θ, d, eɪ, t, u:, j, u:, h, ɔ, ɹ, s, i:.
- Actual Syllables:** Contains segments: s, r, h, æ, p, i:, b, ʌ:, t, eɪ, t, u:, j, u:, ɔ:, z, i:.
- Alignment:** Shows the alignment of target and actual syllables. It groups segments into syllables: (s, i, n̩), (h, æ, p, i:), (b, ʌ, ɹ, θ), (d, eɪ), (t, u:), (j, u:), (h, ɔ, ɹ, s, i:).

### About Syllabification

In the **Syllabification & Alignment** view, the syllable position for each phone in *IPA Target* and *IPA Actual* is displayed.

A number of syllable positions are available, including appendices, onsets, nuclei and codas. Each different phone position is displayed in a distinct color.

Syllabification plays a role in *Phon* Queries; it allows a user to search for a phone in a specific syllable position. For example, phonetic or phonological processes which only occur in onsets may be observed by focusing specifically on consonants in onset positions.

*Phon* will automatically syllabify transcriptions in the *IPA Target* and *IPA Actual* tiers, using any one of its built-in syllable templates (based on syllable structure of the following languages):

- Berber
- Catalan
- Cree
- Dutch
- English
- French
- Gurindji
- Italian
- Portuguese (European)
- Spanish
- Vietnamese

The syllabifier language for a project can be chosen from the **Preferences** dialog. Also, the syllabifier for an individual record may be changed by right-clicking (CTRL+click) on that record's *Target Syllables* or *Actual Syllables* in the **Syllabification & Alignment** view and choosing **Syllabify with > <Language name>** (the current default syllabifier is highlighted in bold in this menu).



**Note:** When faced with irregular utterances or transcriptions, *Phon* may make errors in syllabification. It is important to perform a visual verification of the syllabification of transcriptions in your project in order to ensure that Queries including syllabification information will return accurate results.

## Verify Alignment

Check to ensure proper alignment between *IPA Target* and *IPA Actual* phones.

In order for the Alignment module to work, the *IPA Target* and/or *IPA Actual* transcriptions must be completed (verified in the case of blind transcriptions) and saved. From the **Syllabification & Alignment** view:

1. Select any phone in the *Alignment* tier which does not appear to be properly aligned. An outline will appear around the phone in question.
2. Use OPT/ALT+left/right arrows to move the phone into proper alignment. Alternately, click and drag a phone to re-align it.
3. Use OPT/ALT+up/down arrows to alternate phone selection between Target phones and Actual phones. Repeat Step 2 until all phones are aligned to your satisfaction.

## About Alignment

Displayed in the **Syllabification & Alignment** view, the **Alignment** tier allows a comparison to be made between target (model) forms of utterances and their actual (spoken) realizations.

Alignment is visualized in *Phon* as an arrangement of transcribed phones from *IPA Actual* lined up underneath phones from *IPA Target*. *Phon* makes a comparison between the number, order, and features of target phones and actual phones, in order to determine what phonetic information may have been lost, retained, or added in production.



**Note:** To include syllabification visualization in the *Alignment* tier, select **Color in alignment** in the **Syllabification & Alignment** view.

The screenshot shows the EnglishDemoCorpus interface with two main windows. The top window is 'Record Data' for Speaker Anne, displaying orthography, IPA Target, and IPA Actual transcriptions. The bottom window is 'Syllabification & Alignment', showing three rows of phones: Target Syllables (red boxes), Actual Syllables (blue boxes), and Alignment (green boxes). The 'Color in alignment' checkbox is checked in the Alignment view. A 'Waveform' button is visible at the bottom left of the Alignment view.

This comparison is important for a number of query scripts in *Phon*, such as **Phones**, **Metathesis**, and **Harmony**. These queries require information from both the *IPA Target* and *IPA Actual* tiers, and how the two tiers relate.



**Note:** When faced with irregular utterances or transcriptions, *Phon* may make errors in alignment. It is important to perform a visual verification of the alignment of transcriptions in your project in order to ensure that queries including alignment information will return accurate results.

## Verify Syllabification

Check to ensure proper syllabification of *IPA Target* and *IPA Actual* phones.

In order for the Syllabification module to work, the *IPA Target* and/or *IPA Actual* transcriptions must be completed (verified in the case of blind transcriptions) and saved. From the **Syllabification & Alignment** view:

1. Visually observe the syllabification for each record to determine whether phones are properly syllabified in the *Target Syllables* and/or *Actual Syllables* tier(s).
2. Right click (CTRL+click) on any phone which appears to be improperly syllabified and select the proper syllable constituent from the context menu. Alternately, select the phone in question and type the character underlined in the list below for the proper syllable constituent.
  - Left Appendix
  - Onset
  - Nucleus
  - Coda
  - Right Appendix
  - OEHs (Onset of an Empty-Headed Syllable)
  - Ambisyllabic
  - Unknown

 **Note:** When a transcription contains a sequence of two or more vowels in a row, the Toggle Hiatus option becomes available. This allows the vowels to be either included in the same or separate nuclei.

## View: IPA Validation

### About Blind Transcription

Due to the subjective nature of phonetic transcription (where measurement and verification of all relevant segments may not be feasible), *Phon* has a built-in system for performing multiple-blind transcriptions.

In a multiple-blind transcription process, records are transcribed by any number of separate users, who do not see each other's transcriptions. These separate transcriptions may then be resolved by an objective party, who can choose one over the other or compare them to reach a consensus transcription.

A typical example of multiple-blind transcription in *Phon* may proceed as follows:

- Two users perform separate blind transcriptions of all records in one session (see *Open Session: Blind Transcription* on page 21 for instructions).
- A team of two different users review both sets of blind transcriptions together, while listening to each record.
- For each record, this team does one of three things:
  - chooses the best of the two transcriptions
  - combines both transcriptions to reach a consensus
  - creates an alternate transcription which they agree upon (in extreme cases in which both blind transcriptions seem to be in error).

The transcription which is settled upon is entered into the **IPA Target** or **IPA Actual** field, and can be analyzed accordingly by project researchers, who will now have access to the best and most objective transcriptions possible.

### Validate Blind Transcriptions

Validate completed blind transcriptions.

From the **Project Manager**:

1. Ensure that the **Blind transcription** check box is de-selected and double-click on the session that you would like to validate.  
This will open the **Session Editor** for the specific session.
2. Select the **View > IPA Validation** menu item.  
The **IPA Validation** view will open, with two tiers: *IPA Target Validation* and *IPA Actual Validation*.
3. For each group in the tier(s) you are validating, select the most accurate transcription for that group and click **Set**. Alternately, select the most accurate transcription for all groups in a tier and click **Validate <tier>**.  
The chosen transcriptions will appear in the appropriate tier in the **Record Data** view.

4. From the *IPA Target* and *IPA Actual* tiers, transcriptions can be further modified as the validator sees fit, by typing or by using the **IPA Map** (CMD/CTRL+M).
5. Repeat Steps 3 and 4 until validation has been completed for the entire session.

### Auto-Validate Blind Transcriptions

Automatically validate completed blind transcriptions.

From the **Project Manager**:

1. Ensure that the **Blind transcription** check box is deselected and double-click on the session that you would like to validate.

This will open the **Session Editor** for the specific session.

2. Open the **IPA Validation** view and click the **Auto validate** button at the top.

This will open the **Auto-validate Session** dialog.

3. In the **Tiers** field, choose whether to **Auto-validate IPA Target** and/or **Auto-validate IPA Actual** by selecting the check boxes. Also choose whether to overwrite existing data present in the selected tiers by selecting the **Overwrite existing data** check box.

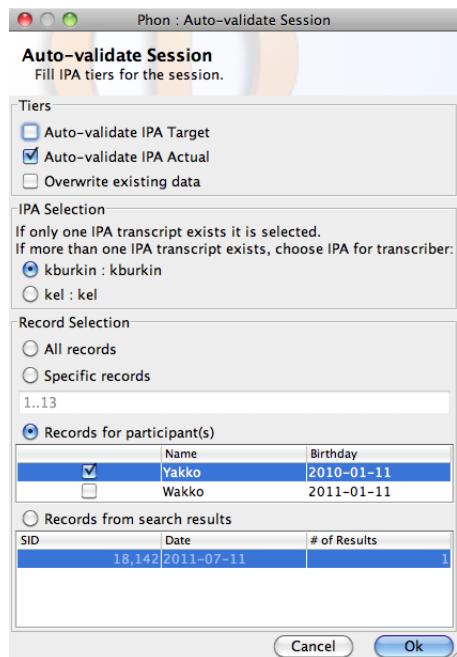
 **Note:** By default, auto-validation will not overwrite data already present in the selected tier(s). The purpose of this is to preserve any transcription which was entered in default mode, or chosen in earlier validations.

4. In the **IPA Selection** field, select a preferred transcriber.

In the event that there is more than one blind transcription for the selected tier in a single record, this transcriber's input will be chosen to fill the tier.

5. In the **Record Selection** field, choose whether to validate **All records**, **Specific records**, **Records for participant(s)**, or **Records from search results**.

 **Note:** If you choose to validate only specific records, you will have to specify the relevant record numbers. To specify several individual record numbers, separate them with a comma and a space. To specify a range, separate the beginning and end record numbers with two periods and a space. If you choose to validate records for specific participants, you must select the participants from the list. If you choose the validate records from search results, you must select a past search from the list.

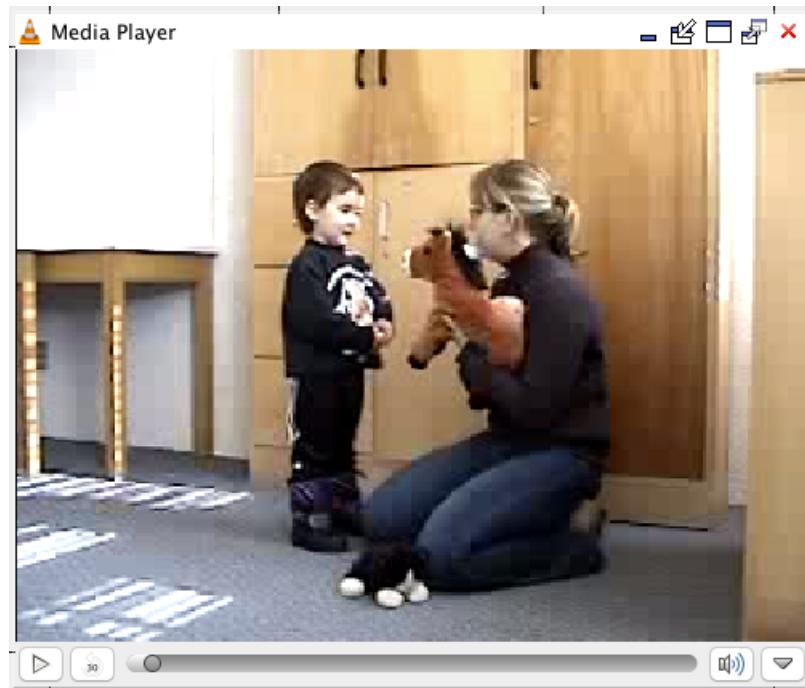


6. When you have selected the appropriate validation options, click **Ok**.

A dialog will appear asking you confirm that you want to auto-validate the selected IPA Tiers and informing you that this action is not undoable. If you are unsure, click **Cancel**. To continue with the auto-validation, click **Ok**.

## View: Media Player

The *Media Player* view allows for playback of session media using VLC.



### About Media

Sessions in *Phon* usually consist of a media recording (either audio or video) coupled with transcriptions of utterances from the recording and separated into *Records*. Each *Record* can be associated via a process called segmentation to the time in the recording during which the utterance occurred.

To facilitate the segmentation and transcription of media files, *Phon* has a built-in media player. This player is available in the **Media Player** view. To use the media player, you must first have a media file linked to your session (see [Link Media to Transcript](#) on page 34 for instructions).

#### Basic Media functions:

- **Play**  
To play your media, click the play button in the **Media Player** view.
- **Volume and Muting**  
To change the volume of playback, click the **Volume** button to the right of the media progress slider, move the volume slider to the desired level (or click the **Toggle mute** button) and then click away from the volume area.
- **Jump playback to another time**  
To change playback time, click on the desired position on the media progress slider. To jump to a specific playback time see .

Other media-related functions include creating and exporting media segments, adjusting segment times, viewing a waveform of a segment's audio, and taking snapshots of your media.

### Open Media

Open a media file which has already been linked to a session.

From the **Session Editor** window:

Choose the **View > Media Player** menu item.

The **Media Player** view will appear.

## Go to a Specific Playback Time

Jump to a specific playback time (either user-specified, at the end of segmented media, or at the end of the last segment for a certain speaker).

From the **Media Player** view:

1. Click on the context menu in the bottom right corner.
2.
  - To go to a user-specified playback time, choose **Go to...** and type over the displayed time value.
  - To go to the end of the last segment in your session, choose **Go to end of segmented media**.
  - To go to the end of the last segment for a particular speaker, choose **Go to end of last segment for <speaker name>**.

## Move Media Position with Record

Choose whether the current media position should move to align with the start of each segment as you navigate between records.

From the **Media Player** view:

Click the context menu in the bottom right corner and select or deselect **Move media position with record**.

When this option is selected, the position marker on the **Media Player** will jump to the beginning of each record to which you navigate in the **Session Editor**.

## Play Adjacency Sequence

Play the current record and the following one, regardless of **Speaker**.

From the **Media Player** view:

Click the context menu in the bottom right corner and choose **Play adjacency sequence**.

The current record's segment and the following record's segment will be played.

## Play Current Segment

Play the media segment specified in the currently visible record.

With the **Media Player** open:

Click the **Play** button next to the *Segment* tier in the **Record Data** view (CMD/CTRL+R). Alternately, click on the context menu in the bottom right corner of the **Media Player** and select **Play current segment**.

## Play Current Speech Turn

Play adjacent utterances produced by the current speaker, starting with the current record.

From the **Media Player** view:

Click the context menu in the bottom right corner and choose **Play current speech turn**.

The current record will be played, followed by subsequent adjacent records by the same speaker.

## Play Custom Segment

Play a user-defined segment of your media file.

From the **Media Player** view:

1. Click the context menu in the bottom right corner and choose **Play custom segment**.
2. Select either **Current segment**, **Speaker turn**, **Adjacency sequence**, **Record range**, or **Specific range**. If you choose **Specific range**, type over the segment values to customize the segment. If you choose **Record range**, click and drag the arrows along the slider to specify a range of records (e.g. records 7 to 9).

 **Note:** It may be useful to click one of the first four segment types before selecting **Specific range**; the previously selected segment type will appear in the range window and you can adjust it from there.

3. Click **Play** to play the specified segment, or click **Close** to cancel.

## Export Media from Media Player

Export clips of your media file from the **Media Player** view.

A media file must be linked to your session.

From the **Media Player** view:

1. Click the arrow at the bottom right of the media field.

This will open a context menu with the options **Take snapshot**, **Export media...**, **Go to...**, **Go to end of segmented media**.



**Note:** If you wish to export the segment for a particular record, this record must be displayed in **Record Data**.

2. Click the **Export media...** menu item.

This will bring you to the **Export Media** window.

3. Select the destination directory for your exported media clip. To do so, click the **Browse** button to the right of the **Output file** field. Specify file name and location for your clip and click **Save**.

The directory and file name you chose will appear in the **Output file** field.



**Note:** By default, your media clip will save in <project\_name>/\_\_res/media/segments/.

4. Specify *Extract segment*, *Include video*, *Include audio*, and *Other arguments* details and click **Next**. This action will activate the export.



**Note:** If you choose not to *Extract segment*, the entire media file will be exported.

5. Once the *PhonWorker shutdown* alert appears at the bottom of the **Export media** window, click the **Close** button. Your media clip will be exported to the specified directory.

### Take Snapshot of Media

Take a snapshot of linked media at the current viewpoint.

From the **Media Player** view, with media open:

1. Click on the arrow to the bottom right of your media and choose the **Take snapshot** option from the context menu.

A **Save As** window will appear.

2. Choose a file name and destination directory for your snapshot and click **Save**.

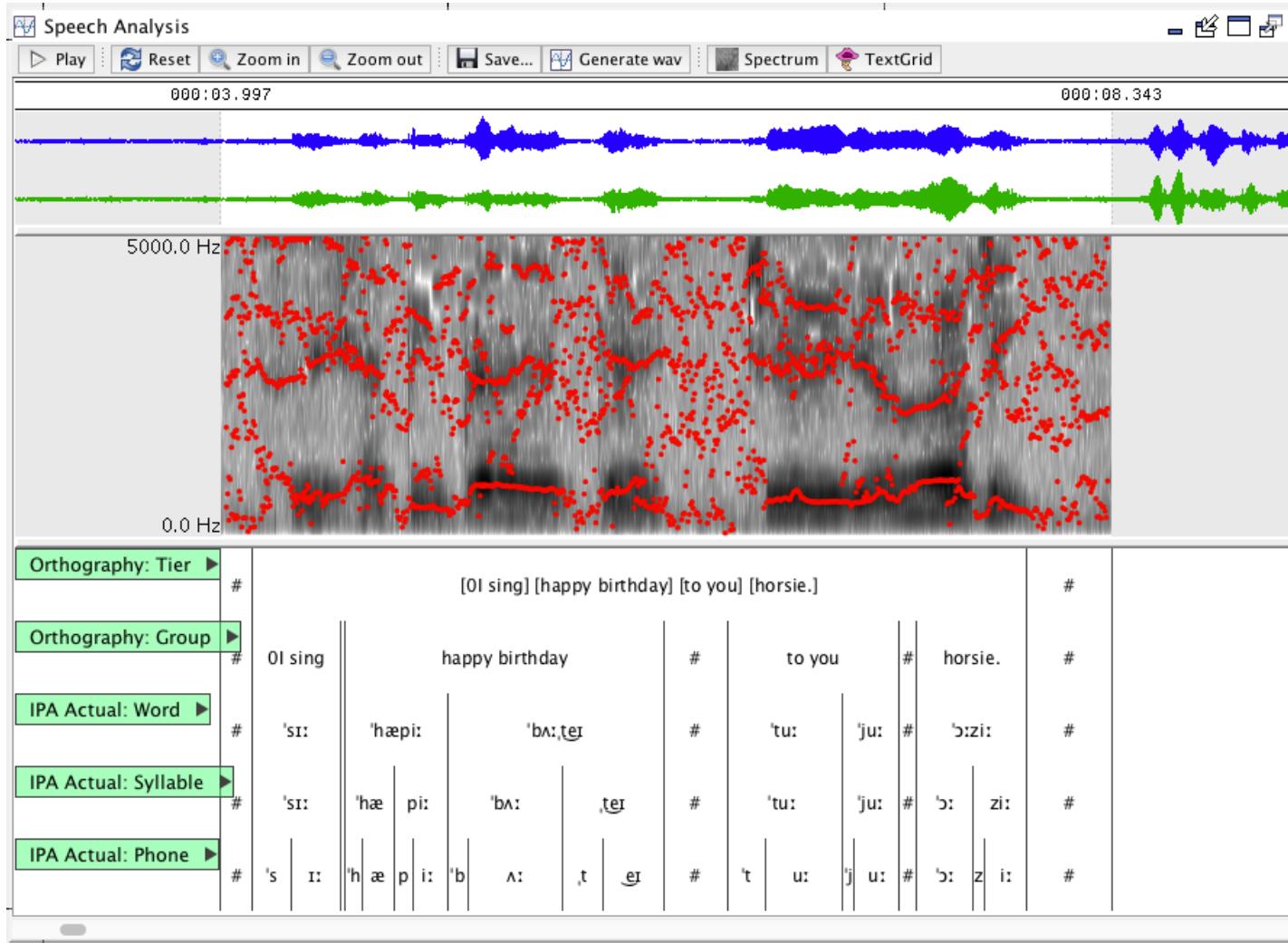
An image of the current frame of your media will be created in the specified location.



**Note:** The image will have the same dimensions as the original video file; the size of the video in the **Media Player** view is irrelevant.

### View: Speech Analysis

The *Speech Analysis* view displays the waveform, spectrogram, and *TextGrid* for the session.



## Waveform

View the speech analysis view for a particular segment.

From the Session Editor:

1. Select the **View > Speech Analysis** menu item.

The waveform will appear.

**Note:** The **Speech Analysis** view displays a buffer of 500ms on either end of each segment. This allows you to expand the segment when adjusting from the **Speech Analysis** view. To view a larger portion of the waveform, click **Show More**. This extends the displayed interval by one second on each side. To redisplay the 500ms buffer, click **Refresh**.

2. To play back the entire waveform, click the **Play** button inside the **Speech Analysis** view. To play back a portion of the segmented audio, highlight that portion in the waveform. Click on the **Play** button inside the **Speech Analysis** view (CMD/CTRL+Shift+R).

The sound will play with the cursor following the corresponding portion of the waveform.

**Note:** If your media is not in .wav format, the first time you open the **Speech Analysis** view with your media linked, you will see a message in the **Speech Analysis** view saying "Audio file not found. Click here to create." Click on this message to export an audio-only version of your media to the project resources folder. The **Speech Analysis** view will access this file to draw the waveform.

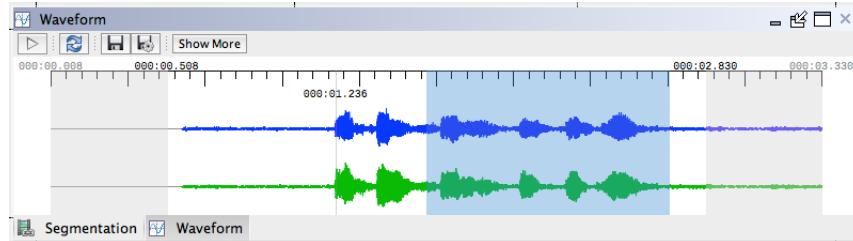
**Note:** You may generate a .wav version of your media file at any time, by clicking the **Generate wav...** button.

## Adjust Segment Start and End Times

Adjust segment start and end times to refine segments.

From the **Speech Analysis** view:

1. Click the **Play** button (CMD/CTRL+Shift+R).  
This action will replay the segment for the displayed record.
2. Select a portion of the waveform for your revised segment and press **Enter**. Alternately, typeover the existing time values in the **Record Data** view with revised values and click the **Refresh** button in the top left area of the **Speech Analysis** view.



This action will adjust your segment start and end times.

**Note:** To view a larger portion of the waveform, click **Show More**. This extends the displayed interval by one second on each side. To redisplay the 500ms buffer, click **Refresh**.

3. If you would like to listen to or further revise the segments, repeat steps 1 and 2.

## Export Audio from Speech Analysis

Export the current audio (.wav) segment from the **Speech Analysis** view.

A media file must already be linked to the session and segmented.

From the **Speech Analysis** view:

1. Click the **Save...** button inside the **Speech Analysis** view.  
A **Browse** window will appear prompting you to choose a save location for your segment.
2. Specify a filename for the segment, navigate to the appropriate save location in the **Browse** window, and click **Save**.  
A .wav audio file of the current segment will be created at the specified file location.

## Spectrogram Tier

The Spectrogram tier for Phon allows for visualization of the segment spectrogram, formants, pitch, and intensity from within Phon's Session Editor window. To display the Spectrogram view choose **Show Spectrogram** from the **Praat** menu in the Speech Analysis view. Options for toggling the display of formant, pitch and intensity data can also be found in the **Praat** menu.

### Spectrogram Settings

Configuring the spectrogram.

Adapted from [http://www.fon.hum.uva.nl/praat/manual/Intro\\_3\\_2\\_\\_Configuring\\_the\\_spectrogram.html](http://www.fon.hum.uva.nl/praat/manual/Intro_3_2__Configuring_the_spectrogram.html)

#### Max Frequency (Hz)

the range of frequencies to display. The standard is 0 Hz at the bottom and 5000 Hz at the top. If this maximum frequency is higher than the Nyquist frequency of the Sound (which is half its sampling frequency), some values in the spectrogram will be zero, and the higher frequencies will be drawn in white. You can see this if you record a Sound at 44100 Hz and set the view range from 0 Hz to 25000 Hz.

#### Window length

the duration of the analysis window. If this is 0.005 seconds (the standard), Praat uses for each frame the part of the sound that lies between 0.0025 seconds before

and 0.0025 seconds after the centre of that frame (for Gaussian windows, Praat actually uses a bit more than that). The window length determines the *bandwidth* of the spectral analysis, i.e. the width of the horizontal line in the spectrogram of a pure sine wave (see below). For a Gaussian window, the -3 dB bandwidth is  $2\sqrt{6\ln(2)}/(\pi \cdot \text{Window length})$ , or 1.2982804 / *Window length*. To get a 'broad-band' spectrogram (bandwidth 260 Hz), keep the standard window length of 5 ms; to get a 'narrow-band' spectrogram (bandwidth 43 Hz), set it to 30 ms (0.03 seconds). The other window shapes give slightly different values.

#### **Dynamic range (dB)**

All values that are more than *Dynamic range* dB below the maximum will be drawn in white. Values in-between have appropriate shades of grey. Thus, if the highest peak in the spectrogram has a height of 30 dB/Hz, and the dynamic range is 50 dB (which is the standard value), then values below -20 dB/Hz will be drawn in white, and values between -20 dB/Hz and 30 dB/Hz will be drawn in various shades of grey.

#### **Window shape**

the shape of the analysis window. To compute the spectrum at, say, 3.850 seconds, samples that lie close to 3.850 seconds are given more weight than samples further away. The relative extent to which each sample contributes to the spectrum is given by the window shape. You can choose from: Gaussian, Square (none, rectangular), Hamming (raised sine-squared), Bartlett (triangular), Welch (parabolic), and Hanning (sine-squared). The Gaussian window is superior, as it gives no *sidelobes* in your spectrogram (see below); it analyzes a factor of 2 slower than the other window shapes, because the analysis is actually performed on twice as many samples per frame.

#### **Time step**

the maximum number of points along the time window for which Praat has to compute the spectrum. If your screen is not wider than 1200 pixels, then the standard of 1000 is appropriate, since there is no point in computing more than one spectrum per one-pixel-wide vertical line. If you have a really wide screen, you may see improvement if you raise this number to 1500.

#### **Frequency step**

the maximum number of points along the frequency axis for which Praat has to compute the spectrum. If your screen is not taller than 768 pixels, then the standard of 250 is appropriate, since there is no point in computing more than one spectrum per one-pixel-height horizontal line. If you have a really tall screen, you may see improvement if you raise this number.

#### **Window shape**

the shape of the analysis window. To compute the spectrum at, say, 3.850 seconds, samples that lie close to 3.850 seconds are given more weight than samples further away. The relative extent to which each sample contributes to the spectrum is given by the window shape. You can choose from: Gaussian, Square (none, rectangular), Hamming (raised sine-squared), Bartlett

(triangular), Welch (parabolic), and Hanning (sine-squared). The Gaussian window is superior, as it gives no *sidelobes* in your spectrogram (see below); it analyzes a factor of 2 slower than the other window shapes, because the analysis is actually performed on twice as many samples per frame.

#### **Preemphasis (dB/octave)**

determines the steepness of a high-pass filter, i.e., how much the power of higher frequencies will be raised before drawing, as compared to lower frequencies. Since the spectral slope of human vowels is approximately -6 dB per octave, the standard value for this setting is +6 dB per octave, so that the spectrum is flattened and the higher formants look as strong as the lower ones. When you raise the preemphasis, frequency bands above 1000 Hz will become darker, those below 1000 Hz will become lighter.

#### **Dynamic compression**

determines how much stronger weak spectra should be made before drawing. Normally, this parameter is between 0 and 1. If it is 0 (the standard value), there is no dynamic compression. If it is 1, all spectra will be drawn equally strong, i.e., all of them will contain frequencies that are drawn in black. If this parameter is 0.4 and the global maximum is at 80 dB, then a spectrum with a maximum at 20 dB (which will normally be drawn all white if the dynamic range is 50 dB), will be raised by  $0.4 * (80 - 20) = 24$  dB, so that its maximum will be seen at 44 dB (thus making this frame visible).

### **List Formants**

List formant values from the **Speech Analysis** view.

A listing of formants can be obtained from the **Speech Analysis** view. To print a formant listing use the following procedure.

1. (Optional) Make a selection in the **Speech Analysis** view.
2. From the **Praat** menu in the **Speech Analysis** view, select **Formant listing**.
3.  **Note:** Options for formant listings can be changed through the **Formant settings** window.

The list of formants will be displayed in a new **Buffers** window for the audio segment/selection.

### **Formant Settings**

Settings for Formant analysis.

Adapted from [http://www.fon.hum.uva.nl/praat/manual/Sound\\_To\\_Formant\\_burg\\_\\_.html](http://www.fon.hum.uva.nl/praat/manual/Sound_To_Formant_burg__.html)

The **Formant settings** window can be opened by choosing **Formant settings...** from the **Praat** menu in the **Speech Analysis** view of the **Session Editor** window.

#### **Time step (s)**

the time between the centres of consecutive analysis frames. If the sound is 2 seconds long, and the time step is 0.01 seconds, there will be approximately 200 analysis frames.

#### **Maximum number of formants**

for most analyses of human speech, you will want to extract 5 formants per frame. This, in combination with the **Maximum formant** setting, is the only way in which this procedure will give you results compatible with how people tend to interpret formants for vowels, i.e. in terms

of vowel height (F1) and vowel place (F2). Otherwise, the **Maximum number of formants** can be any multiple of 0.5, you can choose 4, 4.5, 5, 5.5, 6, and so on.

#### **Maximum formant (Hz)**

the ceiling of the formant search range, in hertz. It is crucial that you set this to a value suitable for your speaker. The standard value of 5500 Hz is suitable for an average adult female. For a male, use 5000 Hz; if you use 5500 Hz for an adult male, you may end up with too few formants in the low frequency region, e.g. analysing an [u] as having a single formant near 500 Hz whereas you want two formants at 300 and 600 Hz. For a young child, use a value much higher than 5500 Hz, for instance 8000 Hz (experiment with it on steady vowels).

#### **Window length (s)**

the effective duration of the analysis window, in seconds. The actual length is twice this value, because Praat uses a Gaussian-like analysis window with sidelobes below -120 dB. For instance, if the **Window length** is 0.025 seconds, the actual Gaussian window duration is 0.050 seconds. This window has values below 4% outside the central 0.025 seconds, and its frequency resolution (-3 dB point) is  $1.298 / (0.025 \text{ s}) = 51.9 \text{ Hz}$ , as computed with the formula given at [Sound: To Spectrogram....](#). This is comparable to the bandwidth of a Hamming window of 0.025 seconds, which is  $1.303 / (0.025 \text{ s}) = 52.1 \text{ Hz}$ , but that window (which is the window most often used in other analysis programs) has three spectral lobes of about -42 dB on each side.

#### **Pre-emphasis from (Hz)**

the +3 dB point for an inverted low-pass filter with a slope of +6 dB/octave. If this value is 50 Hz, then frequencies below 50 Hz are not enhanced, frequencies around 100 Hz are amplified by 6 dB, frequencies around 200 Hz are amplified by 12 dB, and so forth. The point of this is that vowel spectra tend to fall by 6 dB per octave; the pre-emphasis creates a flatter spectrum, which is better for formant analysis because we want our formants to match the local peaks, not the global spectral slope.

#### **Dot size**

Size of formant dots in the display. Use increments of .5 (e.g., 1.5, 2, 2.5, etc.).

Settings for formant listings:

##### **Include num formants**

Include number of formants column

##### **Include intensity**

Include intensity column

##### **Include bandwidths**

Include a bandwidth column for each formant

##### **List Intensity**

List intensity values from the **Speech Analysis** view.

A listing of intensity values can be obtained from the **Speech Analysis** view. To print intensity values use the following procedure.

1. (Optional) Make a selection in the **Speech Analysis** view.
2. From the **Praat** menu in the **Speech Analysis** view, select **Intensity Listing**.

3.  **Note:** Options for intensity listings can be changed through the **Intensity settings** window.

The list of formants will be displayed in a new **Buffers** window for the audio segment/selection.

### Intensity Settings

Configuring the intensity contour

Adapted from [http://www.fon.hum.uva.nl/praat/manual/Sound\\_To\\_Intensity\\_\\_.html](http://www.fon.hum.uva.nl/praat/manual/Sound_To_Intensity__.html)

#### Minimum pitch (Hz)

the minimum periodicity frequency in your signal. If you set it too high, you will end up with a pitch-synchronous intensity modulation. If you set it too low, your intensity contour may appear smeared, so you should set it as high as allowed by the signal if you want a sharp contour.

#### Time step (s)

the time step of the resulting intensity contour. If you set it to zero, the time step is computed as one quarter of the effective window length, i.e. as  $0.8 / (\text{minimum\_pitch})$ .

#### Subtract mean

Modify the intensity value at a time point is computed by subtracting the mean pressure around this point, and then applying the Gaussian window.

### List Pitch

List pitch values from the **Speech Analysis** view.

A pitch listing can be obtained from the **Speech Analysis** view. To print a pitch listing use the following procedure.

1. (Optional) Make a selection in the **Speech Analysis** view.
2. From the **Praat** menu in the **Speech Analysis** view, select **Pitch listing**.
3.  **Note:** Options for pitch listings can be changed through the **Pitch settings** window.

The list of pitch values will be displayed in a new **Buffers** window for the audio segment/selection.

### Pitch Settings

Configuring the pitch contour.

Adapted from [http://www.fon.hum.uva.nl/praat/manual/Sound\\_To\\_Pitch\\_ac\\_\\_.html](http://www.fon.hum.uva.nl/praat/manual/Sound_To_Pitch_ac__.html) and [http://www.fon.hum.uva.nl/praat/manual/Sound\\_To\\_Pitch\\_cc\\_\\_.html](http://www.fon.hum.uva.nl/praat/manual/Sound_To_Pitch_cc__.html)

The **Pitch settings** window can be opened by choosing **Pitch settings...** from the **Praat** menu in the **Speech Analysis** view of the **Session Editor** window. The behaviour of the *Time step* and *Pitch floor* parameters differ depending on the choice of Auto-correlation or Cross-correlation.

#### Sound to Pitch (Auto-correlate)

##### Time step (s) (standard value: 0.0)

the measurement interval (frame duration), in seconds. If you supply 0, Praat will use a time step of  $0.75 / (\text{pitch floor})$ , e.g. 0.01 seconds if the pitch floor is 75 Hz; in this example, Praat computes 100 pitch values per second.

##### Pitch floor (Hz) (standard value: 75 Hz)

candidates below this frequency will not be recruited. This parameter determines the effective length of the analysis window: it will be 3 longest periods long, i.e., if the pitch floor is 75 Hz, the window will be effectively  $3/75 = 0.04$  seconds long.

#### Sound to Pich (Cross-correlate)

##### Time step (s) (standard value: 0.0)

the measurement interval (frame duration), in seconds. If you supply 0, Praat will use a time step of  $0.25 / (\text{pitch floor})$ , e.g. 0.0033333 seconds if the pitch floor is 75

**Pitch floor (Hz) (standard value: 75 Hz)**

Hz; in this example, Praat computes 300 pitch values per second.

candidates below this frequency will not be recruited. This parameter determines the length of the analysis window: it will be 1 longest period long, i.e., if the pitch floor is 75 Hz, the window will be  $1/75 = 0.01333333$  seconds long.



**Note:** Note that if you set the time step to zero, the analysis windows for consecutive measurements will overlap appreciably: Praat will always compute 4 pitch values within one window length, i.e., the degree of *oversampling* is 4.

**Very accurate (standard value: off)**

if *off*, the window is a Hanning window with a physical length of  $3 / (\text{pitch floor})$ . If *on*, the window is a Gaussian window with a physical length of  $6 / (\text{pitch floor})$ , i.e. twice the effective length.

A post-processing algorithm seeks the cheapest path through the candidates. The settings that determine the cheapest path are:

**Pitch ceiling (Hz) (standard value: 600 Hz)**

candidates above this frequency will be ignored.

**Silence threshold (standard value: 0.03)**

frames that do not contain amplitudes above this threshold (relative to the global maximum amplitude), are probably silent.

**Voicing threshold (standard value: 0.45)**

the strength of the unvoiced candidate, relative to the maximum possible autocorrelation. To increase the number of unvoiced decisions, increase this value.

**Octave cost (standard value: 0.01 per octave)**

degree of favouring of high-frequency candidates, relative to the maximum possible autocorrelation. This is necessary because even (or: especially) in the case of a perfectly periodic signal, all undertones of *F0* are equally strong candidates as *F0* itself. To more strongly favour recruitment of high-frequency candidates, increase this value.

**Octave-jump cost (standard value: 0.35)**

degree of disfavouring of pitch changes, relative to the maximum possible autocorrelation. To decrease the number of large frequency jumps, increase this value. In contrast with what is described in the article, this value will be corrected for the time step: multiply by  $0.01 \text{ s} / \text{TimeStep}$  to get the value in the way it is used in the formulas in the article.

**Voiced / unvoiced cost (standard value: 0.14)**

degree of disfavouring of voiced/unvoiced transitions, relative to the maximum possible autocorrelation. To decrease the number of voiced/unvoiced transitions, increase this value. In contrast with what is described in the article, this value will be corrected for the time step: multiply by  $0.01 \text{ s} / \text{TimeStep}$  to get the value in the way it is used in the formulas in the article.

Display settings:

**Dot size**

Size of pitch dots in display.

**TextGrid Tier**

The TextGrid viewer in Phon displays basic TextGrid information about the TextGrid assigned to the current session.

To display the TextGrid view, choose **Show TextGrid** from the **Praat** menu in the Speech Analysis view. You can select audio segments by clicking intervals in the displayed TextGrid.

### **Generate TextGrids**

Generate TextGrids from Phon records.

The following procedure outlines how to generate new TextGrids from Phon record data.

1.  **Note:** You may also open the Generate TextGrids wizard from the **Session Editor** window, in which case skip step 2.

From the **Project Manager** window choose **Plugins > Generate TextGrids...** from the window menu.

2. In the wizard window, select a single session for which TextGrids will be generated. Click **Next**.
3. Choose the records that will be processed. Click **Next**.
4. Select the location for generated TextGrid files. You can generate TextGrid data in the default project location (this is where Phon will look for TextGrid data for records) or into an external folder. In the same screen, choose which Phon tiers will be exported in the TextGrid. When done, click **Generate TextGrids**.

### **Import TextGrids**

Import TextGrids as Phon records.

TextGrids created with Praat may be imported as Phon records. Data from tiers in selected TextGrids will be mapped to Phon tier data.

1. Open the Import TextGrids wizard by using the menu command **Plugins > Import TextGrids...** from the **Project Manager** window.
2. In the first step of the wizard, select a folder containing the TextGrids you wish to import using the browse button on the right-hand side of the text field. When you select the folder, a list of detected tier names from the TextGrids will be displayed in the table.
3. For each TextGrid tier you wish to import, type the name of the Phon tier in the column titled **PhonTier**. You may assign more than one TextGrid tier to the same Phon tier. You may also assign a group marker for each imported tier. When a TextGrid interval with this marker as its text is encountered a new group is created in the Phon record. By default, this is set to '#' as this is how Phon will generate TextGrid files. Click next.
4. Choose which session in the project to which you wish to add the imported records or specify a new session name to be created. Click next.
5. The TextGrids will now be imported. If any errors are encountered they will be displayed in the text area shown in the wizard.

### **Open TextGrid in Praat**

Open a TextGrid managed by Phon in the Praat application.

The TextGrid view in Phon does not provide editing support for TextGrids. To open TextGrids from Phon in Praat use the following procedure.

1.  **Note:** You will need Praat version 5.3.85 or later. Praat must also be open.

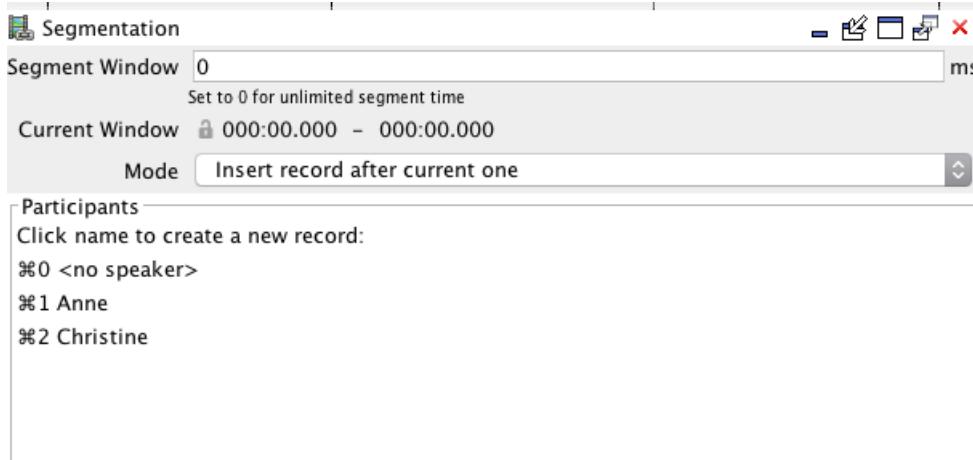
From the **Speech Analysis** view in the **Session Editor** window, choose **Open TextGrid in Praat...** from the Praat menu. The TextGrid in Phon will fade and a button to unlock the TextGrid will be displayed.

2.  **Note:** Phon uses TextGrid tier naming to map values onto Phon tiers. Do not change the names or delete any of the tiers generated by Phon.

In Praat, edit TextGrid intervals as you see fit. You may also add new tiers to the TextGrid.

3. When finished editing the TextGrid, you can send the data back to Phon by choosing **File > Send back to calling program**. The TextGrid in Phon will unlock and its contents updated.

## View: Segmentation



### Segment Media

Segment media into records.

With the **Media Player** and **Segmentation** views open:

1. Click the **Play** button in the **Media Player**.  
This will begin playback of the media file.
2. From the **Segmentation** view, create a new segment by clicking on the **<no speaker>** option or the appropriate participant's name in the **Participants** field. Alternately you may type **CMD/CTRL+0** for an unspecified participant, or **CMD/CTRL+1**, **CMD/CTRL+2**, etc. for a particular participant as noted to the left of his/her name in the list.

When the default segment length is set to 3000 ms, your segment will end when you either click on the participant's name or use the specified keystrokes. The segment will begin 3 seconds before that action. The media file will continue to play.

**Note:** You may want to adjust the default segment length value depending on the nature of your study. Simply type in the desired segment length (in milliseconds) in the **Segment Window** field. A segment window of 0 will make the segment length unlimited; each segment will begin at the endpoint of the previous segment.

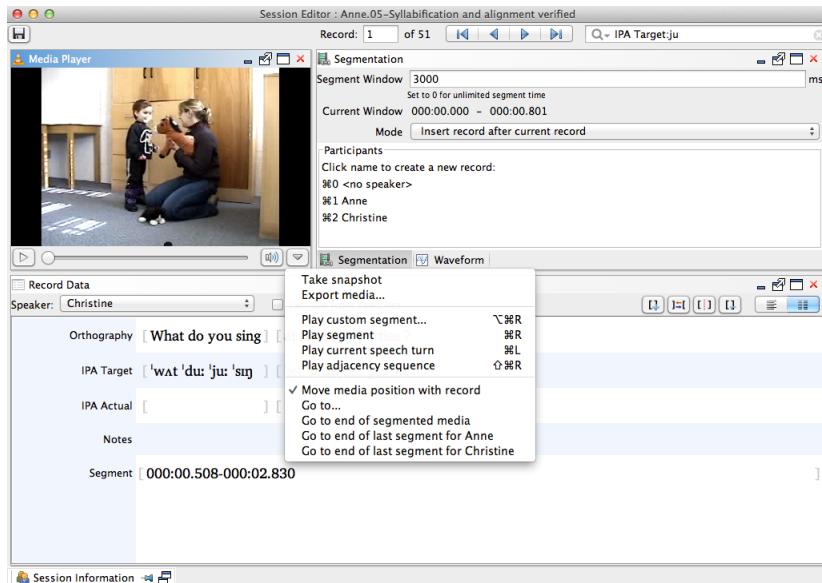
**Note:** The **Current Window** values display the beginning and end time of your segment. The second value always represents the current playback time. The first value represents the beginning of your segment; when in blue this time also corresponds to the end of the previous segment. Clicking this value when it is blue causes the program to ignore the endpoint of the previous segment and change to a segment beginning point appropriate for the **Segment Window** value.

3. Repeat Step 2 after each utterance until the entire media file has been segmented.

By default, this action generates a new record in the **Session Editor** for each segmented media clip and places the new record after the current one.

**Note:** You may instead choose to insert the new record at the end of the session by selecting **Insert record at end of session** from the **Mode** combo box. You may also choose to overwrite the segment for an individual record, if for example you accidentally cut off the end of an utterance. To do so, select **Replace segment for current record** from the **Mode** combo box, and create a new segment with the desired endpoint following Step 2.

**Note:** To resume segmentation from a certain time, click the arrow at the bottom right of the **Media Player**. This will open a context menu with several options. **Go to...** allows you to input a specific time for the player to jump to, **Go to end of segmented media** brings you to the end of your last segment, and **Go to end of last segment for <Participant>** brings you to the end of the last segmented utterance by the specified participant.



## View: IPA Lookup

The IPA Lookup view displays three groups of transcriptions:

- Group #1 Transcription:** [əɪ 'sɪŋ] Set. Orthography I: sing. IPA: [əɪ] [ 'sɪŋ].
- Group #2 Transcription:** [ 'hæpi: 'bɜːθdeɪ] Set. Orthography happy birthday. IPA: [ 'hæpi:] [ 'bɜːθdeɪ].
- Group #3 Transcription:** [ tə 'ju:] Set. Orthography to you. IPA: [ tə] [ 'ju: ].

## Auto Transcribe Session

Automatically transcribe a session using an available built-in dictionary.

The *Orthography* tier must be filled in with words that are valid in the target language.

From the **IPA Lookup** view:

1. Select the appropriate dictionary language in the **IPA Dictionary** field.  
IPA transcriptions filled in through automatic transcription will be selected from this dictionary.
2. Click the **Auto-transcribe Session** button.  
This will open the **Automatic Transcription** dialog.
3. In the **Tier Options** field, choose whether to overwrite existing transcriptions by selecting **Overwrite**. Select whether to transcribe the **IPA Target** tier and/or the **IPA Actual** tier, and choose a **Syllabifier** language.
 

 **Note:** The **Syllabifier** language may differ from the chosen **Dictionary** language. Choosing a **Syllabifier** language allows *Phon* to draw syllabification information in the **Syllabification & Alignment** view.
4. In the **Record Selection** tier, choose whether to transcribe **All records**, **Specific records**, **Records for participant(s)**, or **Records from search results**.
 

 **Note:** If you choose to transcribe only specific records, you will have to specify the relevant record numbers. To specify several individual record numbers, separate them with a comma and a space. To specify a range, separate the beginning and end record numbers with two periods and a space. If you choose to transcribe records for specific participants, you must select the participants from the list. If you choose the transcribe records from search results, you must select a past search from the list.
5. If you are unsure, click **Close**. Otherwise, click **Ok** to perform the automatic transcription.  
The selected tier will be filled in with entries from the chosen built-in dictionary.

### About IPA Lookup Console

The IPA Lookup Console is a function which allows users to lookup transcriptions, and to create and edit IPA dictionaries in *Phon*. The window can be opened by clicking the menu entry **View > IPA Lookup**, and then clicking the **Console** tab. Commands can be entered into the text field located at the bottom of the window, use **Enter** to run the command.

The following commands can be performed on dictionary files (include any quotation marks):

- **use <dictionary>**  
Switch to the specified dictionary. This can also be done using the combo box at the top of the window.
- **create <dictionary>**  
Create a new dictionary with the given name. You may choose to name your dictionary using an *ISO-639-3 Language Code*; for a list of these, see the **ISO-639-3 Language Codes** window.
- **drop <dictionary>**  
Delete a user-created dictionary which you no longer wish to use.
- **list**  
List the available dictionaries.
- **import "</full path/file>"**  
Import entries from the given file into the current dictionary. The specified file should be in UTF-8 encoding with one entry per line in the format "<orthography><tab><ipa>". Alternately, click the **Import IPA** button at the top of the **IPA Lookup** view, locate and select the file for import, and click **Open**.
- **export "</full path/file>"**  
Export user-defined entries in the current dictionary to a UTF-8 encoded text file. Alternately, click the **Export IPA** button at the top of the **IPA Lookup** view, choose a filename and location for export, and click **Save**.

The following commands can be performed on entries (include any quotation marks):

- **add "<orthography>=<ipa>"**  
Add an entry into the IPA database for the currently selected dictionary.
-  **Note:** Characters in <orthography> should be in lower-case.
- **lookup "<orthography>"**

Look up the IPA transcription for the given orthography. The command can also be executed by entering only the orthography (without quotes) in the command field.

- **remove "<orthography>"=<ipa>"**

Remove the IPA transcription for a user-added entry in the currently selected dictionary.

- **remove all**

Remove the IPA transcriptions for all user-added entries in the currently selected dictionary.

Other commands:

- **help**

List all available **Console** commands.

## View: Find & Replace

### Find and Replace

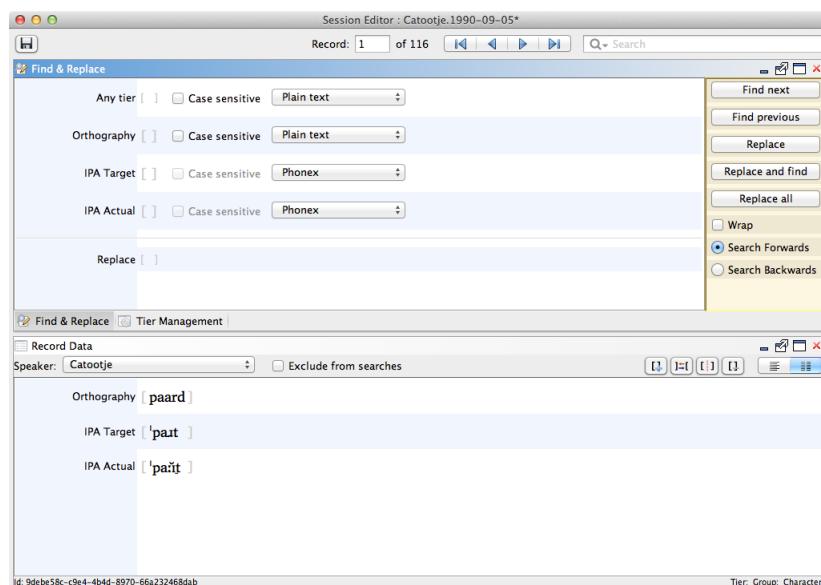
Find and replace text in records within a session.

From **Session Editor** window:

1. Select the **View > Find & Replace** menu item.

The **Find & Replace** view will appear in the **Session Editor**.

 **Note:** The **Find & Replace** view will only show tiers visible in **Record Data**. To change tier visibility options, use the **Tier Management** view (see *Edit Tier Display Options* on page 38 for more information).



2. Using the keyboard or the **IPA Map**, enter a search term within the square brackets in the *Any tier* field or in any visible tier. You may enter search terms in multiple tiers at once.
3. If your search term is in plain text or a regular expression, you may specify whether the search should be **Case sensitive** by using the check box. Use the drop-down menu to select whether the search should use **Plain text**, **Regular expression**, or **Phonex**.
4. Enter a replacement term in the *Replace* field if desired.
5. Click **Find next** to find the next occurrence of the search term(s) in the session, or **Find previous** to find the previous occurrence.

If the term is found in a record, that record will appear in the **Record Data** view with the term highlighted.

 **Note:** You may also select whether your search should **Wrap** by using the check box, and you may choose whether to **Search Fowards** or **Search Backwards**.

- Click **Replace** to replace the highlighted string with the specified replacement.

The highlighted string will be replaced in the **Record Data** view. Repeat Steps 5 and 6 until all occurrences of the string have been replaced.



**Note:** Alternately, click **Replace & Find** to replace the string highlighted in the current record and navigate to the next occurrence of the term. To replace all occurrences of the term in the session at once, click **Replace all**. You will be asked to confirm that you want to **Replace all**. If you are unsure, click **No**. To continue, click **Yes**; this will generate a dialog informing you of the number of times the string occurred and was replaced.

## Tools

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### IPA Map

#### About IPA Map

About the **IPA Map** in *Phon*.

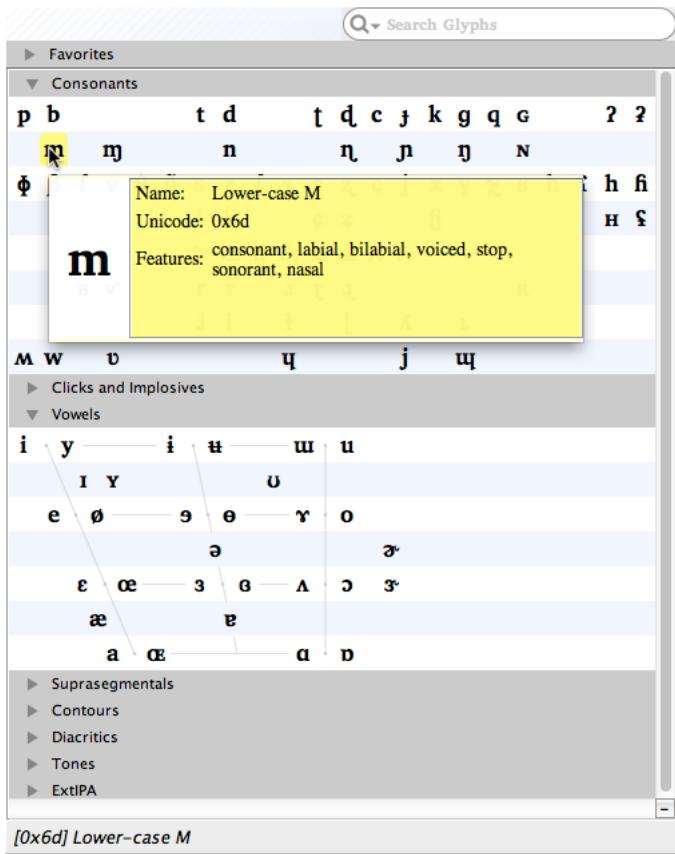
*Phon's IPA Map* provides an easy-to-use interface for composing phonetic transcriptions. There are eight sections in the window, each with a layout which aids in the lookup of phones and diacritics. These sections may be collapsed or expanded by clicking on the appropriate title bar.

#### IPA Map sections:

- Consonants
- Clicks and Implosives
- Vowels
- Suprasegmentals
- Contours
- Diacritics
- Tones
- ExtIPA

Not all characters in the **IPA Map** are meant to be the base glyph in a phone (e.g. suprasegmentals, word boundaries, diacritics). Often, a dependent character is displayed in the **IPA Map** with a circle to represent its relation to the base glyph.

To view the *Name*, *Unicode* value, and *Features* of a character in the **IPA Map**, mouse over the character and a **Tooltip** window will appear.



## Input Text with IPA Map

Create or modify phonetic transcriptions using the **IPA Map**.

The **IPA Map** can be used in any text-input field in *Phon*.

1. Place the cursor in a text-input field and select the **Tools > IPA Map** (CMD/CTRL+M) menu item.  
This will generate a window containing the **IPA Map**.
  2. Click on the buttons in the **IPA Map** which correspond to the characters you would like to enter into the text-input field.  
The data in the text-input field will reflect your selections.
- Note:** While the **IPA Map** is open, you may still proceed to type normally.
3. To close the **IPA Map**, select the **Tools > IPA Map** (CMD/CTRL+M) menu item.

## Copy Character

Copy a character to your computer's clipboard.

From the **IPA Map** window:

Right-click (CTRL+click) on any character in the **IPA Map**. From the context menu, select either **Copy character** to copy as a plain text string, **Copy as HTML** to copy as an HTML code, or **Copy as Unicode HEX** to copy the unicode number.

The character will be copied to your computer's clipboard in the chosen format and can then be pasted into text fields both within *Phon* and in other programs.

## Add Character to Favorites

Add and remove characters from **Favorites** in the **IPA Map**.

From the **IPA Map** window:

1. Right-click (CTRL+click) on any character in the **IPA Map** and select **Add to favorites** from the context menu.

The selected character will appear at the top of the **IPA Map** window in the **Favorites** section. The character will remain in this section until it is removed.

2. To remove a character from the **Favorites** section, right-click (CTRL+click) on it either in the **Favorites** section or in its original section, and select **Remove from favourites** from the context menu.

### **Scroll to a Section**

Jump to a specific section in the **IPA Map**.

From the **IPA Map** window:

Right-click (CTRL+click) within any section of the **IPA Map** and select a section from the **Scroll to** list. The **IPA Map** will scroll such that the selected section appears within the window.

### **Resize Font and Window**

Change the font display size and window size of the **IPA Map**.

From the **IPA Map** window:

Right-click (CTRL+click) within any section in the **IPA Map** and move the **Font size** slider to the preferred font size.

The characters in the **IPA Map** will be displayed in the selected font size; the window will resize itself accordingly.



**Note:** The font display size in the **IPA Map** will not affect the size of characters when input into text fields.

### **Highlight Recently Used Characters**

Highlight recently used characters in the **IPA Map**.

From the **IPA Map** window:

1. Right-click (CTRL+click) within any section of the **IPA Map** and select **Highlight recently used** from the context menu.  
The last twenty characters entered with the **IPA Map** will be highlighted in yellow; the most recently used characters will be the brightest.
2. To turn off this feature, right-click (CTRL+click) within any section of the **IPA Map** and deselect **Highlight recently used** from the context menu.

## **PhonShell**

### **ISO Language Codes**



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# Chapter 2

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## IPA Transcription

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### Topics:

- *IPA Transcription in Phon*
  - *IPA Elements*
  - *Other Transcription Items*
  - *Listing of IPA Characters*
  - *Listing of phonetic features*
- 

# IPA Transcription in Phon

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This document describes how IPA transcriptions are parsed within Phon.

## IPA Elements

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### Phone

Phones are the main unit of an IPA transcription. They are composed of a vowel or consonant (or *base glyph*) along with optional diacritics. Diacritics are of the following types: prefix (e.g., pre-nasalization), combining (e.g., devoicing), length, suffix (e.g., aspiration), and tone. The following sections outline each part of a single Phone.

#### Prefix Diacritic

A prefix diacritic must appear before the base glyph. A phone may have multiple prefix diacritics.

#### Base Glyph

The base glyph can be any IPA vowel or consonant.

#### Combining Diacritic

Combining diacritics must appear directly after the base glyph; any number of combining diacritics may be used. Combining diacritics may also be added to prefix and suffix diacritics.

#### Length

Phone length is indicated using character 0x02D0 (long) and 0x02D1 (half-long.) Length diacritics must appear after the phone to which they belong.

#### Suffix Diacritic

A suffix diacritic must appear after the base glyph. A phone may have multiple suffix diacritics.

#### Tone

Tone diacritics (such as upstep or tone numbers) must appear as the last element in a phone.

 **Note:** Please consult for a list of possible IPA elements and their character types.

Some Possible Phones	Description
ɸ	Aspirated dental [t]
a::: <sup>1</sup>	Triple-long [a], Tone 1
ⁿd	Prenasalised [d]
ṁu	Prenasalised, breathy voiced [u], with combining diacritic low tone

#### Related concepts

[Listing of IPA Characters](#) on page 68

Listing of IPA characters.

## Compound Phone

Compound phones are the combination of two phones using a ligature symbol (either character 0x0361 or 0x035c) between them. Each of the two phones may include prefix, combining, suffix, length, or tone diacritics.

Some Possible Compound Phones	Description
bð	Combined production of [b] and [ð]
að:	Diphthong [âð] with second component sound lengthened

## Pause (Intra-word)

Intra-word pauses are transcribed using a '^' symbol.

**Table 4: Intra-word pauses**

Orthography	Transcription
ca^che	'kæ^s

## Pause (Inter-word)

Inter-word pauses in speech may be transcribed in one of three ways, depending on their length.

**Table 5: Inter-word pauses**

Code	Meaning
(.)	Short pause
(..)	Medium-length pause
(...)	Long pause

**Table 6: Example**

Orthography	Transcription
cache (.) cache	'kaf(.)'kaf

## Stress Marker

Prosodically prominent syllables may be coded for primary or secondary stress. Primary stress is transcribed using a superior vertical stroke (0x2C8) preceding the syllable. Secondary stress is transcribed using an inferior vertical stroke (0x2CC) preceding the syllable.

**Table 7: Some Examples**

Orthography	Transcription
cake	'keɪk
revoke	rə'veʊk
epiglottis	'ɛpɪglɔtɪs

## Syllable Boundary

In cases where syllable boundaries may not be obvious, they can be transcribed with a period between syllables.

**Table 8: Some Examples**

Orthography	Transcription
re-enter	'ri:, ən'ter
sighing	'saɪ.ŋɪŋ

## Word Boundary

Boundaries between words are indicated via a space.

**Table 9: Some Examples**

Orthography	Transcription
ten cats	't̩en 'kæts
on the roof	'an ðə 'ru:f

## Other Transcription Items

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### Intonation Group

Intonation groups are prosodic domains or units which include complete intonational contours. Intonation groups can be minor (e.g. corresponding to noun, verb, or prepositional phrases) or major (e.g. corresponding to entire sentences). Minor groups are separated by a single pipe symbol (0x1C0), and major groups are separated by a double pipe symbol (0x1C1).

**Table 10: Some Example Intonation Groups**

Minor	Major
the dog   jumped   over the fence	It's twelve o'clock    It's time for lunch
the cold wind   gusted strongly	I'm tired    Let's go inside

### Compound Word

Compound words are transcribed using a plus sign between each word.

**Table 11: Some Possible Compound Words**

Orthography	Transcription
dog+house	'dag+hau:s
picture+frame	'pɪktʃə+fle:m

### Sandhi

Description of sandhi.

Linkers are symbols to express a phonological relation between two words, for example in the case of external sandhi phenomenon. For example, while 'an' and 'apple' for two separate words, the final 'n' of the determiner is syllabified within the onset of the following syllable. We represent this relations as 'an\_apple' [ə'næpəl].

## Contraction

A contraction is a combination of two words within a phrase, involving the reduction of one of the words. In Phon, contractions may be transcribed using the overtie character, 0x2040.

Contraction

Orthography: [l'ami]  
IPA Actual: [l‿ami]

## Linkers (including Liaison)

Linkers are transcribed using the undertie character 0x203f.

Liaison

Orthography: [les‿ami]  
IPA Target: [le‿zami]

## Listing of IPA Characters

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Listing of IPA characters.

The following is a listing of all supported IPA characters along with the glyph unicode value, name, token type and feature set.

**Table 12: Supported IPA Characters**

Glyph	Unicode Value	Name	Type	Features
∅	0x2205	Empty Set	cover symbol	null
	0x20	Space	space	diacritic
\$	0x24	Dollar Sign	dollar sign	
{	0x7B	Open Brace	open brace	
}	0x7D	Close Brace	close brace	
:	0x3A	Colon	colon	
0	0x30	Zero	digit	
1	0x31	One	digit	
2	0x32	Two	digit	
3	0x33	Three	digit	
4	0x34	Four	digit	
5	0x35	Five	digit	
6	0x36	Six	digit	
7	0x37	Seven	digit	
8	0x38	Eight	digit	

Glyph	Unicode Value	Name	Type	Features
9	0x39	Nine	digit	
^	0x5E	Caret	intra word pause	
↔	0x2194	Left Right Arrow	alignment	diacritic
!	0x1C3	Latin Letter Retroflex Click	consonant	consonant coronal lingual alveolar voiceless stop obstruent click oral ingressive
(	0x28	Left Parenthesis	open paren	diacritic
)	0x29	Right Parenthesis	close paren	diacritic
*	0x2A	Asterisk	cover symbol	unintelligible cover
+	0x2B	Plus sign	plus	diacritic
.	0x2E	Full Stop	period	diacritic
A	0x41	Latin Capital Letter A	cover symbol	cover
B	0x42	Latin Capital Letter B	cover symbol	cover
C	0x43	Latin Capital Letter C	cover symbol	consonant cover oral
D	0x44	Latin Capital Letter D	cover symbol	cover
E	0x45	Latin Capital Letter E	cover symbol	cover
F	0x46	Latin Capital Letter F	cover symbol	cover semiresonant
G	0x47	Latin Capital Letter G	cover symbol	consonant glide cover oral
H	0x48	Latin Capital Letter H	cover symbol	cover
I	0x49	Latin Capital Letter I	cover symbol	cover
J	0x4A	Latin Capital Letter J	cover symbol	cover
K	0x4B	Latin Capital Letter K	cover symbol	cover
L	0x4C	Latin Capital Letter L	cover symbol	cover
M	0x4D	Latin Capital Letter M	cover symbol	cover
N	0x4E	Latin Capital Letter N	cover symbol	cover

Glyph	Unicode Value	Name	Type	Features
O	0x4F	Latin Capital Letter O	cover symbol	cover
P	0x50	Latin Capital Letter P	cover symbol	cover
Q	0x51	Latin Capital Letter Q	cover symbol	cover quasiresonant
R	0x52	Latin Capital Letter R	cover symbol	cover raspberry
S	0x53	Latin Capital Letter S	cover symbol	cover
T	0x54	Latin Capital Letter T	cover symbol	cover
U	0x55	Latin Capital Letter U	cover symbol	cover
V	0x56	Latin Capital Letter V	cover symbol	vowel cover
W	0x57	Latin Capital Letter W	cover symbol	cover
X	0x58	Latin Capital Letter X	cover symbol	unintelligible cover
Y	0x59	Latin Capital Letter Y	cover symbol	cover
Z	0x5A	Latin Capital Letter Z	cover symbol	cover
>	0x3E	Greater-than Sign	glide	consonant glide transition
a	0x61	Latin Letter Small A	vowel	vowel low lax central
b	0x62	Latin Letter Small B	consonant	consonant labial bilabial voiced stop obstruent oral
c	0x63	Latin Letter Small C	consonant	consonant palatal coronal lingual posterior voiceless stop obstruent oral
d	0x64	Latin Letter Small D	consonant	consonant coronal lingual anterior alveolar voiced stop obstruent oral
e	0x65	Latin Letter Small E	vowel	vowel mid tense atr front
f	0x66	Latin Letter Small F	consonant	consonant labial labiodental voiceless continuant obstruent fricative oral
g	0x67	Latin Letter Small G	consonant	consonant dorsal velar lingual voiced stop obstruent oral
h	0x68	Latin Letter Small H	consonant	consonant guttural laryngeal voiceless continuant obstruent fricative oral

Glyph	Unicode Value	Name	Type	Features
i	0x69	Latin Letter Small I	vowel	vowel high tense atr front
j	0x6A	Latin Letter Small J	glide	consonant glide palatal coronal lingual posterior voiced approximant continuant sonorant oral
k	0x6B	Latin Letter Small K	consonant	consonant dorsal velar lingual voiceless stop obstruent oral
l	0x6C	Latin Letter Small L	consonant	consonant coronal lingual anterior alveolar voiced approximant liquid lateral continuant sonorant oral
m	0x6D	Latin Letter Small M	consonant	consonant labial bilabial voiced stop sonorant nasal
n	0x6E	Latin Letter Small N	consonant	consonant coronal lingual anterior alveolar voiced stop sonorant nasal
o	0x6F	Latin Letter Small O	vowel	vowel round mid tense atr back
p	0x70	Latin Letter Small P	consonant	consonant labial bilabial voiceless stop obstruent oral
q	0x71	Latin Letter Small Q	consonant	consonant dorsal uvular lingual voiceless stop obstruent oral
r	0x72	Latin Letter Small R	consonant	consonant coronal lingual anterior alveolar voiced approximant liquid rhotic continuant sonorant trill oral
s	0x73	Latin Letter Small S	consonant	consonant coronal lingual anterior alveolar voiceless continuant obstruent fricative oral strident
t	0x74	Latin Letter Small T	consonant	consonant coronal lingual anterior alveolar voiceless stop obstruent oral
u	0x75	Latin Letter Small U	vowel	vowel round high tense atr back
v	0x76	Latin Letter Small V	consonant	consonant labial labiodental voiced continuant obstruent fricative oral
w	0x77	Latin Letter Small W	glide	consonant glide labial bilabial dorsal velar lingual voiced approximant continuant sonorant oral
x	0x78	Latin Letter Small X	consonant	consonant dorsal velar lingual voiceless continuant obstruent fricative oral
y	0x79	Latin Letter Small Y	vowel	vowel round high tense atr front
z	0x7A	Latin Letter Small Z	consonant	consonant coronal lingual anterior alveolar voiced continuant obstruent fricative oral strident
í	0xA1	Inverted Exclamation Mark	consonant	consonant coronal lingual anterior voiceless stop click oral ingressive subapical

Glyph	Unicode Value	Name	Type	Features
¹	0xB9	Superscript One (Number 1)	tone	diacritic tone1
²	0xB2	Superscript Two (Number 2)	tone	diacritic tone2
³	0xB3	Superscript Three (Number 3)	tone	diacritic tone3
⁴	0x2074	Superscript Four (Number 4)	tone	diacritic tone4
⁵	0x2075	Superscript Five (Number 5)	tone	diacritic tone5
⁶	0x2076	Superscript Six (Number 6)	tone	diacritic tone6
⁷	0x2077	Superscript Seven (Number 7)	tone	diacritic tone7
⁸	0x2078	Superscript Eight (Number 8)	tone	diacritic tone8
⁹	0x2079	Superscript Nine (Number 9)	tone	diacritic tone9
æ	0xE6	Latin Letter Small AE	vowel	vowel low lax front
ç	0xE7	Latin Letter Small C with cedilla	consonant	consonant palatal coronal lingual posterior voiceless continuant obstruent fricative oral strident
ð	0xF0	Latin Letter Small Eth	consonant	consonant interdental coronal lingual anterior distributed voiced continuant obstruent fricative oral
ø	0xF8	Latin Letter Small O with Stroke	vowel	vowel round mid tense atr front
ħ	0x127	Latin Letter Small H with Stroke	consonant	consonant guttural pharyngeal voiceless continuant obstruent fricative oral
ŋ	0x14B	Latin Letter Small Eng	consonant	consonant dorsal velar lingual voiced stop sonorant nasal
œ	0x153	Latin Small Ligature OE	vowel	vowel round mid rtr lax front

Glyph	Unicode Value	Name	Type	Features
ƀ	0x180	Latin Letter Small B with Stroke	consonant	consonant labial bilabial voiced continuant obstruent fricative oral
߱	0x188	Latin Letter Small C with Hook	consonant	consonant palatal coronal lingual posterior voiceless stop obstruent implosive oral
߲	0x199	Latin Letter Small K with Hook	consonant	consonant dorsal velar lingual voiceless stop obstruent implosive oral
߳	0x19B	Latin Letter Small Lamda with Stroke	consonant	consonant coronal lingual anterior alveolar voiceless lateral obstruent affricate oral
ߴ	0x19E	Latin Letter Small N with Long Right Leg	consonant	consonant coronal lingual anterior alveolar voiced stop sonorant nasal
߶	0x1A5	Latin Letter Small P with Hook	consonant	consonant labial bilabial voiceless stop obstruent implosive oral
߷	0x1AB	Latin Letter Small T with Palatal Hook	consonant	consonant palatal coronal lingual anterior posterior alveolar voiceless stop obstruent oral
߸	0x1B9	Latin Letter Small Ezh Reversed	consonant	consonant guttural pharyngeal voiced continuant obstruent fricative oral
߹	0x1BA	Latin Letter Small Ezh with Tail	consonant	consonant palatal coronal lingual posterior alveopalatal distributed voiced continuant obstruent fricative oral strident
ߺ	0x1C0	Latin Letter Dental Click	consonant	consonant dental coronal lingual anterior voiceless stop obstruent click oral ingressive
߻	0x1C1	Latin Letter Lateral Click	consonant	consonant coronal lingual anterior alveolar voiceless lateral stop obstruent click oral ingressive
߻	0x1C2	Latin Letter Alveopalatal Click	consonant	consonant coronal lingual posterior alveopalatal voiceless stop obstruent click oral ingressive
߻	0x234	Latin Letter Small L with Curl	consonant	consonant palatal coronal lingual posterior voiced approximant liquid lateral continuant sonorant oral
߻	0x235	Latin Letter Small N with Curl	consonant	consonant coronal lingual posterior alveopalatal voiced stop sonorant nasal
߻	0x236	Latin Letter Small T with Curl	consonant	consonant coronal lingual posterior alveopalatal voiceless stop obstruent oral

Glyph	Unicode Value	Name	Type	Features
ә	0x250	Latin Letter Small Turned A	vowel	vowel low lax central
ә	0x251	Latin Letter Small Alpha	vowel	vowel low lax back
ә	0x252	Latin Letter Small Turned Alpha	vowel	vowel round low lax back
ә	0x253	Latin Letter Small B with Hook	consonant	consonant labial bilabial voiced stop obstruent implosive oral
ә	0x254	Latin Letter Small Open O	vowel	vowel round mid rtr lax back
ә	0x255	Latin Letter Small C with Curl	consonant	consonant palatal laminal coronal lingual posterior distributed voiceless continuant obstruent fricative oral strident
ә	0x256	Latin Letter Small D with Tail	consonant	consonant coronal lingual posterior retroflex voiced stop obstruent oral
ә	0x257	Latin Letter Small D with Hook	consonant	consonant coronal lingual anterior alveolar voiced stop obstruent implosive oral
ә	0x258	Latin Letter Small Reversed E	vowel	vowel mid tense atr central
ә	0x259	Latin Letter Small Schwa	vowel	vowel schwa mid rtr lax central
ә	0x25A	Latin Letter Small Schwa with Hook	vowel	vowel schwa rhotic mid rtr lax central
ә	0x25B	Latin Letter Small Open E	vowel	vowel mid rtr lax front
ә	0x25C	Latin Letter Small Reversed Open E	vowel	vowel mid rtr lax central
ә	0x25D	Latin Letter Small Reversed Open E with Hook	vowel	vowel rhotic mid rtr lax central
ә	0x25E	Latin Letter Small Closed Reversed Open E	vowel	vowel round mid rtr lax central

Glyph	Unicode Value	Name	Type	Features
ጀ	0x25F	Latin Letter Small Dotless J with Stroke	consonant	consonant palatal coronal lingual posterior voiced stop obstruent oral
ጀጀ	0x260	Latin Letter Small G with Hook	consonant	consonant dorsal velar lingual voiced stop obstruent implosive oral
ጀጀጀ	0x261	Latin Letter Small Script G	consonant	consonant dorsal velar lingual voiced stop obstruent oral
ጀጀጀጀ	0x262	Latin Letter Small Capital G	consonant	consonant dorsal uvular lingual voiced stop obstruent oral
ጀጀጀጀጀ	0x263	Latin Letter Small Gamma	consonant	consonant dorsal velar lingual voiced continuant obstruent fricative oral
ጀጀጀጀጀጀ	0x264	Latin Letter Small Ram's Horns	vowel	vowel mid tense atr back
ጀጀጀጀጀጀጀ	0x265	Latin Letter Small Turned H	glide	consonant glide labial bilabial palatal coronal lingual voiced approximant continuant sonorant oral
ጀጀጀጀጀጀጀጀ	0x266	Latin Letter Small H with Hook	consonant	consonant guttural laryngeal voiced continuant obstruent fricative oral
ጀጀጀጀጀጀጀጀጀ	0x267	Latin Letter Small Heng with Hook	consonant	consonant dorsal velar coronal lingual posterior alveopalatal voiceless continuant obstruent fricative oral
ጀጀጀጀጀጀጀጀጀጀ	0x268	Latin Letter Small I with Stroke	vowel	vowel high tense atr central
ጀጀጀጀጀጀጀጀጀጀጀ	0x269	Latin Letter Small Iota	vowel	vowel high rtr lax front
ጀጀጀጀጀጀጀጀጀጀጀጀ	0x26A	Latin Letter Small Capital I	vowel	vowel high rtr lax front
ጀጀጀጀጀጀጀጀጀጀጀጀጀ	0x26B	Latin Letter Small L with middle Tilde	consonant	consonant velar coronal lingual anterior posterior voiced approximant liquid lateral continuant sonorant oral
ጀጀጀጀጀጀጀጀጀጀጀጀጀጀ	0x26C	Latin Letter Small L with Belt	consonant	consonant coronal lingual anterior alveolar voiceless lateral continuant obstruent fricative oral
ጀጀጀጀጀጀጀጀጀጀጀጀጀጀጀ	0x26D	Latin Letter Small L with Retroflex Hook	consonant	consonant coronal lingual posterior retroflex voiced approximant liquid lateral continuant sonorant oral
ጀጀጀጀጀጀጀጀጀጀጀጀጀጀጀጀጀ	0x26E	Latin Letter Small LEzh	consonant	consonant coronal lingual anterior alveolar voiced lateral continuant obstruent fricative oral

Glyph	Unicode Value	Name	Type	Features
w	0x26F	Latin Letter Small Turned M	vowel	vowel high tense atr back
wl	0x270	Latin Letter Small Turned M with Long Leg	glide	consonant glide dorsal velar lingual voiced approximant continuant sonorant oral
m̊	0x271	Latin Letter Small M with Hook	consonant	consonant labial labiodental voiced stop sonorant nasal
n̊	0x272	Latin Letter Small N with Left Hook	consonant	consonant palatal coronal lingual posterior voiced stop sonorant nasal
ɳ	0x273	Latin Letter Small N with Retroflex Hook	consonant	consonant coronal lingual posterior retroflex voiced stop sonorant nasal
N̊	0x274	Latin Letter Small Capital N	consonant	consonant dorsal uvular lingual voiced stop sonorant nasal
ə	0x275	Latin Letter Small Barred O	vowel	vowel round mid tense atr central
œ	0x276	Latin Letter Small Capital OE	vowel	vowel round low lax front
ø	0x277	Latin Letter Small Closed Omega	vowel	vowel round high rtr lax back
ɸ	0x278	Latin Letter Small Phi	consonant	consonant labial bilabial voiceless continuant obstruent fricative oral
ɹ	0x279	Latin Letter Small Turned R	consonant	consonant coronal lingual anterior alveolar voiced approximant liquid rhotic continuant sonorant oral
ɿ	0x27A	Latin Letter Small Turned R with Long Leg	consonant	consonant coronal lingual anterior alveolar voiced approximant liquid lateral continuant sonorant flap oral
ɭ	0x27B	Latin Letter Small Turned R with Hook	consonant	consonant coronal lingual posterior retroflex voiced approximant liquid rhotic continuant sonorant oral
ɻ	0x27C	Latin Letter Small R with Long Leg	consonant	consonant coronal lingual alveolar voiced approximant rhotic continuant sonorant trill oral
ɮ	0x27D	Latin Letter Small R with Tail	consonant	consonant coronal lingual posterior retroflex voiced approximant liquid rhotic continuant sonorant flap oral

Glyph	Unicode Value	Name	Type	Features
r	0x27E	Latin Letter Small R with Fish Hook	consonant	consonant coronal lingual anterior alveolar voiced approximant liquid rhotic continuant sonorant flap oral
R	0x280	Latin Letter Small Capital R	consonant	consonant dorsal uvular lingual voiced approximant liquid rhotic continuant sonorant trill oral
ꝑ	0x281	Latin Letter Small Capital Inverted R	consonant	consonant dorsal uvular lingual voiced rhotic continuant obstruent fricative oral
ꝑ	0x282	Latin Letter Small S with Hook	consonant	consonant coronal lingual posterior retroflex voiceless continuant obstruent fricative oral strident
ſ	0x283	Latin Letter Small Esh	consonant	consonant laminal coronal lingual posterior alveopalatal distributed voiceless continuant obstruent fricative oral strident
ſ	0x284	Latin Letter Small Dotless J with Stroke and Hook	consonant	consonant palatal coronal lingual posterior voiced stop obstruent implosive oral
ſ	0x286	Latin Letter Small Esh with Curl	consonant	consonant palatal coronal lingual posterior alveopalatal distributed voiceless continuant obstruent fricative oral strident
ꝑ	0x287	Latin Letter Small Turned T	consonant	consonant coronal lingual anterior voiceless stop obstruent click oral ingressive
ꝑ	0x288	Latin Letter Small T with Retroflex Hook	consonant	consonant coronal lingual posterior retroflex voiceless stop obstruent oral
ꝑ	0x289	Latin Letter Small U Bar	vowel	vowel round high tense atr central
ꝑ	0x28A	Latin Letter Small Upsilon	vowel	vowel round high rtr lax back
ꝑ	0x28B	Latin Letter Small V with Hook	consonant	consonant glide labial voiced approximant continuant sonorant oral
ꝑ	0x28C	Latin Letter Small Turned V	vowel	vowel mid rtr lax back
ꝑ	0x28D	Latin Letter Small Turned W	consonant	consonant labial bilabial dorsal velar lingual voiceless continuant obstruent fricative oral
ꝑ	0x28E	Latin Letter Small Turned Y	consonant	consonant palatal coronal lingual posterior voiced approximant liquid lateral continuant sonorant oral

Glyph	Unicode Value	Name	Type	Features
Y	0x28F	Latin Letter Small Capital Y	vowel	vowel round high rtr lax front
ʐ	0x290	Latin Letter Small Z with Retroflex Hook	consonant	consonant coronal lingual posterior retroflex voiced continuant obstruent fricative oral strident
ʐ	0x291	Latin Letter Small Z with Curl	consonant	consonant palatal laminal coronal lingual posterior distributed voiced continuant obstruent fricative oral strident
ڙ	0x292	Latin Letter Small Ezh	consonant	consonant laminal coronal lingual posterior alveopalatal distributed voiced continuant obstruent fricative oral strident
ڙ	0x293	Latin Letter Small Ezh with Curl	consonant	consonant palatal coronal lingual posterior alveopalatal distributed voiced continuant obstruent fricative oral strident
ڻ	0x294	Latin Letter Glottal Stop	consonant	consonant guttural laryngeal voiceless stop obstruent oral
ڮ	0x295	Latin Letter Pharyngeal Voiced Fricative	consonant	consonant guttural pharyngeal voiced continuant obstruent fricative oral
ڢ	0x296	Latin Letter Inverted Glottal Stop	consonant	consonant coronal lingual anterior alveolar voiceless lateral stop obstruent click oral ingressive
ڦ	0x297	Latin Letter Stretched C	consonant	consonant coronal lingual anterior alveolar voiceless stop obstruent click oral ingressive
ڦ	0x298	Latin Letter Bilabial Click	consonant	consonant labial bilabial voiceless stop obstruent click oral ingressive
ڦ	0x299	Latin Letter Small Capital B	consonant	consonant labial bilabial labiodental voiced approximant continuant sonorant trill oral
ڻ	0x29A	Latin Letter Small Closed Open E	vowel	vowel round mid rtr lax central
ڻ	0x29B	Latin Letter Small Capital G with Hook	consonant	consonant dorsal uvular lingual voiced stop obstruent implosive oral
ڻ	0x29C	Latin Letter Small Capital H	consonant	consonant guttural epiglottal voiceless continuant obstruent fricative oral
ڣ	0x29D	Latin Letter Small J with Crossed-Tail	consonant	consonant palatal coronal lingual posterior voiced continuant obstruent fricative oral strident

Glyph	Unicode Value	Name	Type	Features
ʞ	0x29E	Latin Letter Small Turned K	consonant	consonant dorsal velar lingual voiceless stop obstruent click oral ingressive
ł	0x29F	Latin Letter Small Capital L	consonant	consonant dorsal velar lingual voiced approximant liquid lateral continuant sonorant oral
ϙ	0x2A0	Latin Letter Small Q with Hook	consonant	consonant dorsal uvular lingual voiceless stop obstruent implosive oral
ϙ	0x2A1	Latin Letter Glottal Stop with Stroke	consonant	consonant guttural epiglottal voiceless stop obstruent oral
ϙ	0x2A2	Latin Letter Reversed Glottal Stop with Stroke	consonant	consonant guttural epiglottal voiced continuant obstruent fricative oral
ʣ	0x2A3	Latin Letter Small DZ Digraph	consonant	consonant coronal lingual anterior alveolar voiced obstruent affricate oral strident
ʤ	0x2A4	Latin Letter Small DEzh Digraph	consonant	consonant laminal coronal lingual posterior alveopalatal distributed voiced obstruent affricate oral strident
ʣ	0x2A5	Latin Letter Small DZ Digraph with Curl	consonant	consonant palatal laminal coronal lingual posterior distributed voiced obstruent affricate oral strident
ʦ	0x2A6	Latin Letter Small TS Digraph	consonant	consonant coronal lingual anterior alveolar voiceless obstruent affricate oral strident
ʃ	0x2A7	Latin Letter Small TEsh Digraph	consonant	consonant laminal coronal lingual posterior alveopalatal distributed voiceless obstruent affricate oral strident
ʨ	0x2A8	Latin Letter Small TC Digraph with Curl	consonant	consonant palatal laminal coronal lingual posterior distributed voiceless obstruent affricate oral strident
ɸ	0x2A9	Latin Letter Small FEng Digraph	consonant	consonant obstruent fricative nasal velopharyngeal
ɫ	0x2AA	Latin Letter Small LS Digraph	consonant	consonant coronal lingual anterior alveolar voiceless lateral continuant obstruent fricative oral
ɿ	0x2AB	Latin Letter Small LZ Digraph	consonant	consonant coronal lingual anterior alveolar voiced lateral continuant obstruent fricative oral

Glyph	Unicode Value	Name	Type	Features
ѡ	0x2AC	Latin Letter Bilabial Percussive	consonant	consonant labial bilabial stop obstruent oral percussive
՛	0x2AD	Latin Letter Bidental Percussive	consonant	consonant dental stop obstruent oral lowerdental percussive
՚	0x2AE	Latin Letter Small Turned H with Fish Hook	vowel	vowel round high rtr lax back
՚	0x2B0	Modifier Letter Small H	suffix diacritic	diacritic aspirated
՚	0x2B1	Modifier Letter Small H with Hook	suffix diacritic	diacritic breathyvoiced
՚	0x2B2	Modifier Letter Small J	suffix diacritic	diacritic palatal
՚	0x2B3	Modifier Letter Small R	suffix diacritic	diacritic rhotic
՚	0x2B4	Modifier Letter Small Turned R	suffix diacritic	diacritic rhotic
՚	0x2B5	Modifier Letter Small Turned R with Hook	suffix diacritic	diacritic rhotic
՚	0x2B6	Modifier Letter Small Capital Inverted R	suffix diacritic	diacritic rhotic
՚	0x2B7	Modifier Letter Small W	suffix diacritic	diacritic labial
՚	0x2B8	Modifier Letter Small Y	suffix diacritic	diacritic labial
՚	0x2BB	Modifier Letter Turned Comma	suffix diacritic	diacritic aspirated
՚	0x2BC	Modifier Letter Apostrophe	suffix diacritic	diacritic ejective
՚	0x2BD	Modifier Letter Reversed Comma	suffix diacritic	diacritic weaklyaspirated
՚	0x2BE	Modifier Letter Right Half Ring	suffix diacritic	diacritic morerounded
՚	0x2BF	Modifier Letter Left Half Ring	suffix diacritic	diacritic lessrounded

Glyph Value	Unicode	Name	Type	Features
՞	0x2C0	Modifier Letter Glottal Stop	suffix diacritic	diacritic laryngeal
՞	0x2C1	Modifier Letter Reversed Glottal Stop	suffix diacritic	diacritic epiglottal
՚	0x2C8	Modifier Letter Vertical Line	primary stress	diacritic prstress
՚	0x2CC	Modifier Letter Low Vertical Line	secondary stress	diacritic secstress
՚	0x2D0	Modifier Letter Colon	long Triangular	diacritic long
՚	0x2D1	Modifier Letter Colon	half long Half Triangular	diacritic halflong
՚	0x2DE	Modifier Letter Rhotic Hook	suffix diacritic	diacritic rhotic
՚	0x2E0	Modifier Letter Small Gamma	suffix diacritic	diacritic velar
՚	0x2E1	Modifier Letter Small L	suffix diacritic	diacritic lateral
՚	0x2E5	Modifier Letter Extra-High Tone Bar	suffix diacritic	diacritic toneextrahigh
՚	0x2E6	Modifier Letter High Tone Bar	suffix diacritic	diacritic tonehigh
՚	0x2E7	Modifier Letter Mid Tone Bar	suffix diacritic	diacritic tonemid
՚	0x2E8	Modifier Letter Low Tone Bar	suffix diacritic	diacritic tonelow
՚	0x2E9	Modifier Letter Extra-Low Tone Bar	suffix diacritic	diacritic toneextralow
՚	0x2EC	Modifier Letter Voicing	suffix diacritic	diacritic voiced
՚	0x2ED	Modifier Letter Unaspirated	suffix diacritic	diacritic unaspirated
՞	0x300	Combining Grave Accent	combining diacritic	diacritic tonelow
՞	0x301	Combining Acute Accent	combining diacritic	diacritic tonehigh

Glyph	Unicode Value	Name	Type	Features
circumflex accent	0x302	Combining Circumflex Accent	combining diacritic	diacritic tonefalling
tilde	0x303	Combining Tilde	combining diacritic	diacritic nasal
macron	0x304	Combining Macron	combining diacritic	diacritic tonemid
breve	0x306	Combining Breve	combining diacritic	diacritic extrashort
dot above	0x307	Combining Dot Above	combining diacritic	diacritic lenis
diaeresis	0x308	Combining Diaeresis	combining diacritic	diacritic central
ring above	0x30A	Combining Ring Above	combining diacritic	diacritic voiceless
double acute accent	0x30B	Combining Double Acute Accent	combining diacritic	diacritic toneextrahigh
caron	0x30C	Combining Caron	combining diacritic	diacritic tonerising
double grave accent	0x30F	Combining Double Grave Accent	combining diacritic	diacritic toneextralow
inverted breve	0x311	Combining Inverted Breve	combining diacritic	diacritic fronted
left tack below	0x318	Combining Left Tack Below	combining diacritic	diacritic atr
right tack below	0x319	Combining Right Tack Below	combining diacritic	diacritic rtr
left angle above	0x31A	Combining Left Angle Above	combining diacritic	diacritic unreleased
left half ring below	0x31C	Combining Left Half Ring Below	combining diacritic	diacritic lessrounded
up tack below	0x31D	Combining Up Tack Below	combining diacritic	diacritic raised
down tack below	0x31E	Combining Down Tack Below	combining diacritic	diacritic approximant sonorant lowered

Glyph	Unicode Value	Name	Type	Features
ꝑ	0x31F	Combining Plus Sign Below	combining diacritic	diacritic advanced
Ꝓ	0x320	Combining Minus Sign Below	combining diacritic	diacritic retracted
ꝓ	0x323	Combining Dot Below	combining diacritic	diacritic lenis
Ꝕ	0x324	Combining Diaeresis Below	combining diacritic	diacritic breathyvoiced
ꝕ	0x325	Combining Ring Below	combining diacritic	diacritic voiceless
Ꝗ	0x329	Combining Vertical Line Below	combining diacritic	diacritic syllabic
ꝗ	0x32A	Combining Bridge Below	combining diacritic	diacritic dental
Ꝙ	0x32C	Combining Caron Below	combining diacritic	diacritic voiced
ꝙ	0x32F	Combining Inverted Breve Below	combining diacritic	diacritic nonsyllabic
Ꝛ	0x330	Combining Tilde Below	combining diacritic	diacritic creakyvoiced
ꝛ	0x334	Combining Tilde Overlay	combining diacritic	diacritic pharyngeal
Ꝝ	0x339	Combining Right Half Ring Below	combining diacritic	diacritic morerounded
ꝝ	0x33A	Combining Inverted Bridge Below	combining diacritic	diacritic apical
Ꝟ	0x33B	Combining Square Below	combining diacritic	diacritic laminal
ꝟ	0x33C	Combining Seagull Below	combining diacritic	diacritic labial
Ꝡ	0x33D	Combining X Above	combining diacritic	diacritic mid
ꝡ	0x346	Combining Bridge Above	combining diacritic	diacritic lowerdental
Ꝣ	0x347	Combining Equal Sign Below	combining diacritic	diacritic alveolar

Glyph	Unicode Value	Name	Type	Features
ጀ	0x348	Combining Double Vertical Line Below	combining diacritic	diacritic strong articulation
ጀ	0x349	Combining Left Angle Below	combining diacritic	diacritic weak articulation
ጀ	0x34A	Combining Not Tilde Above	combining diacritic	diacritic denasalized
ጀ	0x34B	Combining Homothetic Above	combining diacritic	diacritic nasal
ጀ	0x34C	Combining Almost Equal To Above	combining diacritic	diacritic velopharyngeal
ጀ	0x34D	Combining Left Right Arrow Below	combining diacritic	diacritic labialspread
ጀ	0x34E	Combining Upwards Arrow Below	combining diacritic	diacritic whistled
ጀ	0x354	Combining Left Arrow Head Below	combining diacritic	diacritic fronted
ጀ	0x355	Combining Right Arrow Head Below	combining diacritic	diacritic backed
ጀ	0x35C	Combining Double Breve Below	ligature	diacritic
ጀ	0x361	Combining Double Inverted Breve	ligature	diacritic
ጀ	0x362	Combining Double Rightwards Arrow Below	ligature	diacritic sliding
ጀ	0x3B1	Greek Small Letter Alpha	vowel	vowel low lax central
ጀ	0x3B2	Greek Small Letter Beta	consonant	consonant labial bilabial voiced continuant obstruent fricative oral
ጀ	0x3B4	Greek Small Letter Delta	consonant	consonant dental coronal lingual anterior distributed voiced continuant obstruent fricative oral

Glyph	Unicode Value	Name	Type	Features
θ	0x3B8	Greek Small Letter Theta	consonant	consonant interdental coronal lingual anterior distributed voiceless continuant obstruent fricative oral
λ	0x3BB	Greek Small Letter Lamda	consonant	consonant coronal lingual anterior alveolar voiced lateral obstruent affricate oral
π	0x3C0	Greek Small Letter Pi	consonant	consonant labial dental voiced stop obstruent oral
χ	0x3C7	Greek Small Letter Chi	consonant	consonant dorsal uvular lingual voiceless continuant obstruent fricative oral
▫	0x1D4A	Modifier Letter Small Schwa	suffix diacritic	diacritic schwa
▫	0x1D50	Modifier Letter Small M	prefix diacritic	diacritic bilabial nasal
▫	0x1D51	Modifier Letter Small Eng	prefix diacritic	diacritic velar nasal
▫	0x207F	Modifier Letter Small N	prefix diacritic	diacritic nasal
▫	0x1DAC	Modifier Letter Small M with Hook	prefix diacritic	diacritic labial dental nasal
▫	0x1DAE	Modifier Letter Small N with Left Hook	prefix diacritic	diacritic palatal nasal
▫	0x1DAF	Modifier Letter Small N with Retroflex Hook	prefix diacritic	diacritic retroflex nasal
▫	0x1DB0	Modifier Letter Small Capital N	prefix diacritic	diacritic uvular nasal
▫	0x1D91	Latin Letter Small D with Hook and Tail	consonant	consonant coronal lingual posterior alveolar retroflex voiced stop implosive oral
⠇	0x2016	Double Vertical Line	major group	diacritic
⠇	0x7C	Vertical Line	minor group	diacritic
↑	0x2191	Upwards Arrow	tone	diacritic egressive
↓	0x2193	Downwards Arrow	tone	diacritic ingressive
↗	0x2197	Northeast Arrow	tone	diacritic toneglobalrise
↘	0x2198	Southeast Arrow	tone	diacritic toneglobalfall

Glyph	Unicode Value	Name	Type	Features
#	0xA71B	Up Arrow	tone	diacritic toneupstep
#	0xA71C	Down Arrow	tone	diacritic tonedownstep
-	0x335	Combining Short Stroke Overlay - Affix Diacritic Role Switcher	role reversal	diacritic
f	0x192	Latin Letter Small F with Hook	consonant	consonant labial bilabial voiceless continuant obstruent fricative oral
(	0x203F	Undertie	sandhi	diacritic sandhi
(	0x2040	Overtie	sandhi	diacritic
l	0x1AA	Latin Letter Reversed Esh with Loop	consonant	consonant coronal lingual posterior alveopalatal distributed voiceless continuant obstruent fricative oral
t	0x1AD	Latin Letter Small T with Hook	consonant	consonant coronal lingual anterior alveolar voiceless stop obstruent implosive oral
q	0x265	Latin Letter Small Turned H	consonant	consonant glide labial bilabial palatal coronal lingual voiced approximant continuant sonorant oral
w	0x270	Latin Letter Small Turned M with Long Leg	consonant	consonant glide dorsal velar lingual voiced approximant continuant sonorant oral
i	0x131	Latin Letter Small Dotless I	vowel	vowel high tense atr front
ō	0x1DC4	Combining Macron-Acute	combining diacritic	diacritic tonerising tonehigh
ō	0x1DC5	Combining Grave-Macron	combining diacritic	diacritic tonelowrising
ō	0x1DC6	Combining Macron-Grave	combining diacritic	diacritic
ō	0x1DC7	Combining Acute-Macron	combining diacritic	diacritic
ō	0x1DC8	Combining Grave-Acute-Grave	combining diacritic	diacritic tonerisingfalling
↑	0x2191	Upwards Arrow	tone	diacritic egressive
↓	0x2193	Downwards Arrow	tone	diacritic ingressive
↗	0x2197	North-East arrow	tone	diacritic toneglobalrise

Glyph Value	Unicode	Name	Type	Features
↘	0x2198	South-East Arrow	tone	diacritic toneglobalfall
#	0xA71B	Modifier Letter Raised Up Arrow	tone	diacritic toneupstep
#	0xA71C	Modifier Letter Raised Down Arrow	tone	diacritic tonedownstep
<	0x2C2	Modifier Letter Left Arrowhead	suffix diacritic	diacritic fronted
>	0x2C3	Modifier Letter Right Arrowhead	suffix diacritic	diacritic backed
˄	0x2C4	Modifier Letter Up Arrowhead	suffix diacritic	diacritic raised
˅	0x2C5	Modifier Letter Down Arrowhead	suffix diacritic	diacritic lowered
^	0x2C6	Modifier Letter Circumflex Accent	tone	diacritic tonefalling
ˇ	0x2C7	Caron	tone	diacritic tonerising
-	0x2C9	Modifier Letter Macron	tone	diacritic tonemid
'	0x2CA	Modifier Letter Acute Accent	tone	diacritic tonehigh
`	0x2CB	Modifier Letter Grave Accent	tone	diacritic toneextrahigh
˘	0x2D4	Modifier Letter Up Tack	tone	diacritic raised
˙	0x2D5	Modifier Letter Down Tack	tone	diacritic lowered
+	0x2D6	Modifier Letter Plus Sign	suffix diacritic	diacritic advanced
-	0x2D7	Modifier Letter Minus Sign	suffix diacritic	diacritic retracted
~	0x2DC	Small Tilde	suffix diacritic	diacritic nasal
s	0x2E2	Modifier Letter Small S	suffix diacritic	diacritic affricate
x	0x2E3	Modifier Letter Small X	suffix diacritic	diacritic velar

Glyph	Unicode Value	Name	Type	Features
ᜄ	0x2E4	Modifier Letter Small Reversed Glottal Stop	suffix diacritic	diacritic pharyngeal
ᜅ	0x2EF	Modifier Letter Low Down Arrowhead	suffix diacritic	diacritic lowered
ᜆ	0x2F0	Modifier Letter Low Up Arrowhead	suffix diacritic	diacritic raised
ᜇ	0x2F1	Modifier Letter Low Left Arrowhead	suffix diacritic	diacritic fronted
ᜈ	0x2F2	Modifier Letter Low Right Arrowhead	suffix diacritic	diacritic backed
ᜉ	0x2F5	Modifier Letter Middle Double Grave Accent	tone	diacritic toneextralow
ᜊ	0x2F6	Modifier Letter Middle Double Acute Accent	tone	diacritic toneextrahigh
ᜋ	0x2F8	Modifier Letter Raised Colon	tone	diacritic long
ᜌ	0x2F9	Modifier Letter Begin High Tone	tone	diacritic tonehigh
ᜍ	0x2FA	Modifier Letter End High Tone	tone	diacritic tonehigh
ᜎ	0x2FB	Modifier Letter Begin Low Tone	tone	diacritic tonelow
ᜏ	0x2FC	Modifier Letter End Low Tone	tone	diacritic tonelow
ᜐ	0x2FD	Modifier Letter Shelf	tone	diacritic
ᜑ	0x2FE	Modifier Letter Open Shelf	tone	diacritic
ᜒ	0x2FF	Modifier Letter Low Left Arrow	tone	diacritic
ᜓ	0x1DBB	Modifier Letter Small Z	suffix diacritic	diacritic affricate
᜔	0x1DB4	Modifier Letter Small Esh	suffix diacritic	diacritic affricate

Glyph Value	Unicode	Name	Type	Features
ᬁ	0x1DBE	Modifier Letter Small Ezh	suffix diacritic	diacritic affricate
ᩀ	0x1DBF	Modifier Letter Small Theta	suffix diacritic	diacritic dental coronal lingual anterior distributed voiceless continuant obstruent
ᩂ	0x1D56	Modifier Letter Small P	suffix diacritic	diacritic labial
ᩄ	0x1D57	Modifier Letter Small T	suffix diacritic	diacritic coronal
ᩆ	0x1D4F	Modifier Letter Small K	suffix diacritic	diacritic dorsal
ᩇ	0x1D47	Modifier Letter Small B	suffix diacritic	diacritic labial
ᩈ	0x1D48	Modifier Letter Small D	suffix diacritic	diacritic coronal
ᩉ	0x1D4D	Modifier Letter Small G	suffix diacritic	diacritic dorsal
=	0x207C	Superscript Equals Sign	suffix diacritic	diacritic unaspirated
ᩊ	0x309	Combining Hook Above	combining diacritic	diacritic
ᩋ	0x310	Combining Candrabindu	combining diacritic	diacritic
ᩌ	0x312	Combining Turned Comma Above	combining diacritic	diacritic aspirated
ᩍ	0x314	Combining Reversed Comma Above	combining diacritic	diacritic weakly aspirated
ᩎ	0x316	Combining Grave Accent Below	combining diacritic	diacritic tonerising
ᩏ	0x32B	Combining Inverted Double Arch Below	combining diacritic	diacritic
ᩐ	0x32E	Combining Breve Below	combining diacritic	diacritic derhoticized
ᩑ	0x331	Combining Macron Below	combining diacritic	diacritic retracted
ᩒ	0x332	Combining Low Line	combining diacritic	diacritic alveolar
ᩓ	0x333	Combining Double Low Line	combining diacritic	diacritic

Glyph	Unicode Value	Name	Type	Features
{o'}	0x33E	Combining Vertical Tilde	combining diacritic	diacritic distorted
{ō}	0x33F	Combining Double Overline	combining diacritic	diacritic unaspirated
{ȯ}	0x350	Combining Right Arrowhead Above	combining diacritic	diacritic backed
{ö}	0x351	Combining Left Half Ring Above	combining diacritic	diacritic lessrounded
{ỏ}	0x352	Combining Fermata	combining diacritic	diacritic
{o̊}	0x353	Combining X Below	combining diacritic	diacritic
{ő}	0x356	Combining Right Arrowhead and Up Arrowhead Below	combining diacritic	diacritic
{ǒ}	0x357	Combining Right Half Ring Above	combining diacritic	diacritic morerounded
{ō̄}	0x35D	Combining Double Breve	combining diacritic	diacritic
{ō̄̄}	0x35E	Combining Double Macron	combining diacritic	diacritic
{ō̄̄̄}	0x35F	Combining Double Macron Below	combining diacritic	diacritic
{ō̄̄̄̄}	0x360	Combining Double Tilde	combining diacritic	diacritic
{ō̄̄̄̄̄}	0x363	Combining Latin Letter Small A	combining diacritic	diacritic
{ō̄̄̄̄̄̄}	0x364	Combining Latin Letter Small E	combining diacritic	diacritic
{ō̄̄̄̄̄̄̄}	0x365	Combining Latin Letter Small I	combining diacritic	diacritic

Glyph	Unicode Value	Name	Type	Features
ଓ	0x366	Combining Latin Letter Small O	combining diacritic	diacritic
ଓ̄	0x367	Combining Latin Letter Small U	combining diacritic	diacritic
ଓ̂	0x368	Combining Latin Letter Small C	combining diacritic	diacritic
ଓ̄̄	0x369	Combining Latin Letter Small D	combining diacritic	diacritic
ଓ̄̄̄	0x36A	Combining Latin Letter Small H	combining diacritic	diacritic aspirated
ଓ̄̄̄̄	0x36B	Combining Latin Letter Small M	combining diacritic	diacritic nasal
ଓ̄̄̄̄̄	0x36C	Combining Latin Letter Small R	combining diacritic	diacritic rhotic
ଓ̄̄̄̄̄̄	0x36D	Combining Latin Letter Small T	combining diacritic	diacritic
ଓ̄̄̄̄̄̄̄	0x36E	Combining Latin Letter Small V	combining diacritic	diacritic
ଓ̄̄̄̄̄̄̄̄	0x36F	Combining Latin Letter Small X	combining diacritic	diacritic
·	0x387	Greek Ano Teleia	suffix diacritic	diacritic halflong
ଓ̄̄̄̄̄̄̄̄̄	0x1DC9	Falling Rising Tone	combining diacritic	diacritic tonefallingrising
#	0x2C71	Latin Letter Small V with Right Hook	consonant	consonant labial labiodental lingual voiced approximant continuant sonorant flap oral
#	0xA71D	MODIFIER LETTER AFRICANIST DOWNSTEP	suffix diacritic	diacritic tonedownstep
#	0xA71E	MODIFIER LETTER AFRICANIST UPSTEP	suffix diacritic	diacritic toneupstep

Glyph	Unicode Value	Name	Type	Features
ı	0x1DA6	MODIFIER LETTER SMALL CAPITAL I	suffix diacritic	diacritic palatal
v	0x1DB7	MODIFIER LETTER SMALL UPSILON	suffix diacritic	diacritic labial

## Listing of phonetic features

---

Listing of phonetic features.

The following is a listing of all the supported phonetic features.

**Table 13: Features**

Name	Synonyms	Primary Family	Secondary Family
null			
diacritic			
unintelligible			
unreleased		diacritic	
consonant	c		
vowel	v		
glide	g		
cover			
schwa	sch		
labial	lab	place	labial
bilabial	bil	place	labial
round		place	labial
palatal	pal	place	dorsal
dorsal	dor	place	dorsal
velar	vel	place	dorsal
uvular	uvu	place	dorsal
guttural	gut	place	guttural
pharyngeal	pha	place	guttural
laryngeal	lar glottal	place	guttural
epiglottal	epi	place	guttural
dental	den	place	coronal
labiodental		place	coronal

Name	Synonyms	Primary Family	Secondary Family
interdental		place	coronal
apical	api	place	coronal
laminal	lam	place	coronal
coronal	cor	place	coronal
lingual	lin	place	
anterior	ant	place	coronal
posterior	pos	place	coronal
alveolar	alv	place	coronal
alveopalatal	alp postalveolar	place	coronal
retroflex		place	coronal
distributed	dis	place	coronal
voiceless	vcl	voicing	voicing
voiced	vcd	voicing	voicing
aspirated		voicing	voicing
weakly aspirated		voicing	voicing
unaspirated		voicing	voicing
approximant	app	manner	continuancy
liquid	liq	manner	continuancy
lateral	lat	manner	continuancy
rhotic	rho	manner	continuancy
stop	plosive	manner	continuancy
continuant	cnt	manner	continuancy
obstruent	obs	manner	continuancy
sonorant	son	manner	continuancy
fricative	fri	manner	continuancy
affricate	aff delayedrelease	manner	continuancy
click		manner	continuancy
implosive		manner	continuancy
flap	tap	manner	continuancy
trill		manner	continuancy
ejective		manner	continuancy
nasal	nas	manner	nasality
oral		manner	nasality
prenasalized		manner	nasality
strident	str	manner	stridency
low		height	

Name	Synonyms	Primary Family	Secondary Family
mid		height	
high		height	
tense		tongue root	
atr		tongue root	
rtr		tongue root	
lax		tongue root	
front		backness	
central		backness	
back		backness	
derhoticized		diacritic	
syllabic	syl	diacritic	
nonsyllabic		diacritic	
advanced		diacritic	
retracted		diacritic	
lowered		diacritic	
raised		diacritic	
fronted		diacritic	
backed		diacritic	
morerounded		diacritic	
lessrounded		diacritic	
long		diacritic	
halflong		diacritic	
extrashort		diacritic	
breathyvoiced		diacritic	
creakyvoiced		diacritic	
prstress	1	diacritic	
secstress	2	diacritic	
toneglobalrise		diacritic	
tonedownstep		diacritic	
tonefalling		diacritic	
tonerisingfalling		diacritic	
tonefallingrising		diacritic	
tonelowrising		diacritic	
tonehighrising		diacritic	
tonerising		diacritic	
tonehigh		diacritic	

Name	Synonyms	Primary Family	Secondary Family
tonemid		diacritic	
toneglobalfall		diacritic	
toneextrahigh		diacritic	
tonelow		diacritic	
toneupstep		diacritic	
toneextralow		diacritic	
tone1		diacritic	
tone2		diacritic	
tone3		diacritic	
tone4		diacritic	
tone5		diacritic	
tone6		diacritic	
tone7		diacritic	
tone8		diacritic	
tone9		diacritic	
pause		diacritic	
denasalized		diacritic	nasality
egressive		diacritic	manner
ingressive		diacritic	manner
labialspread		diacritic	labial
lowerdental		diacritic	place
narealfricative		nasality	manner
percussive		manner	
sliding		diacritic	manner
strongarticulation		diacritic	manner
weakarticulation		diacritic	manner
distorted		diacritic	
subapical		place	coronal
velopharyngeal		place	
velopharyngealfricative		diacritic	manner
whistled		diacritic	manner
lenis		diacritic	manner
sandhi		diacritic	
quasiresonant		place	
semiresonant		place	
raspberry		place	

Name	Synonyms	Primary Family	Secondary Family
transition		place	



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# Chapter

# 3

---

## Phonex

---

### Topics:

- *Introduction*
  - *Language Reference*
  - *Supplementary Matchers*
  - *Examples*
- 

## Introduction

---

Phonex is a pattern matching language for IPA transcriptions. It was developed for the *Phon* application as a method of searching for phones and phone sequences using terminology familiar with linguists, for example through the use of phonetic features and syllable constituent types.

## Language Reference

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### Phonex Constructs

A summary of phonex constructs.

**Table 14: Phone matchers**

Construct	Matches
<i>x</i>	The phone <i>x</i> . Matches regardless of diacritics.
<i>x_y</i>	The compound phone consisting of phones matched by <i>x</i> and <i>y</i> .
\unnnn	The phone with unicode value <i>nnnn</i> as a hexadecimal number.
\*	The * cover symbol.
\.	The . syllable boundary marker.
\+	The + compound word marker.
\^	The ^ intra-word pause maker.
's'	The phone with text that matches the regular expression <i>s</i>
{f <sub>0</sub> , f <sub>1</sub> , ..., f <sub>n</sub> }	The phone with features f <sub>0</sub> ... f <sub>n</sub>

**Table 15: Phone classes**

Construct	Matches
[xyz]	<i>x</i> , <i>y</i> , or <i>z</i>
[^xyz]	Not <i>x</i> , <i>y</i> , or <i>z</i>

**Table 16: Predefined phone classes**

Construct	Matches
.	Anything
\c	Any consonant
\g	Any glide
\v	Any vowel
\p	Any intra-word pause (i.e., ^)
\P	Any inter-word pause (e.g., (.), (..), ...)
\w	Any word character (i.e., consonants, vowels, syllable boundaries, and syllable stress)
\W	Any non-word character (i.e., any character not matched by \w, e.g., same as [-\w])

Construct	Matches
\s	Any stress marker

**Table 17: Boundary matchers**

Construct	Matches
^	Beginning of input
\$	End of input
\b	A word boundary including beginning of input, end of input, and whitespace.
\S	A syllable boundary including 'forced' syllable boundaries such as beginning of input, end of input, and whitespace; and, if syllable constituent types are available, 'soft' syllable boundaries detected at syllable edges.

**Table 18: Plug-ins**

Construct	Matches
<i>x:plugin('s')</i>	<i>x</i> if, and only if, the plug-in matcher identified by <i>plugin</i> matches with expression <i>s</i>
<i>x&amp;y</i>	<i>x</i> if, and only if, a diacritic attached to <i>x</i> matches the expression <i>y</i> . (e.g., <i>h&amp;{aspirated}</i> will match all 'h's with aspirated diacritics.)
<i>x:</i>	Same as <i>x&amp;{long}</i> .
<i>x!s</i>	<i>x</i> if, and only if, the syllable stress of the phone matches <i>s</i> .

**Table 19: Quantifiers (greedy)**

Construct	Matches
<i>X?</i>	<i>X</i> , once or not at all
<i>X*</i>	<i>X</i> , zero or more times
<i>X+</i>	<i>X</i> , one or more times
<i>X&lt;n&gt;</i>	<i>X</i> , exactly <i>n</i> times
<i>X&lt;n,&gt;</i>	<i>X</i> , at least <i>n</i> times
<i>X&lt;,n&gt;</i>	<i>X</i> , zero to <i>n</i> times
<i>X&lt;,n,m&gt;</i>	<i>X</i> , at least <i>n</i> but not more than <i>m</i> times

**Table 20: Quantifiers (reluctant)**

Construct	Matches
<i>X??</i>	<i>X</i> , once or not at all
<i>X*?</i>	<i>X</i> , zero or more times
<i>X+?</i>	<i>X</i> , one or more times
<i>X&lt;n&gt;?</i>	<i>X</i> , exactly <i>n</i> times
<i>X&lt;n,&gt;?</i>	<i>X</i> , at least <i>n</i> times
<i>X&lt;,n&gt;?</i>	<i>X</i> , zero to <i>n</i> times
<i>X&lt;,n,m&gt;?</i>	<i>X</i> , at least <i>n</i> but not more than <i>m</i> times

**Table 21: Quantifiers (possessive)**

Construct	Matches
$X?+$	$X$ , once or not at all
$X^*+$	$X$ , zero or more times
$X^{++}$	$X$ , one or more times
$X^{}+$	$X$ , exactly $n$ times
$X^{<n,>+}$	$X$ , at least $n$ times
$X^{<,n>+}$	$X$ , zero to $n$ times
$X^{<n,m>+}$	$X$ , at least $n$ but not more than $m$ times

**Table 22: Grouping**

Construct	Matches
$(X)$	$X$ , as a <i>capturing group</i>
$(?=X)$	$X$ , as a <i>non-capturing group</i>
$(name=X)$	$X$ , as a <i>named, capturing group</i> . <i>name</i> may consist of letters and numbers, but must start with a letter.
$\backslash n$	The content matched by group $n$
$(?<X)$	Look behind and match $X$ as a non-capturing group
$(?>X)$	Look ahead and match $X$ as a non-capturing group

## Phone Matchers

Various methods of matching phones using phonex 2.0.

As outlined in the Phonex Constructs section, there are several methods for matching phones in phonex. This section describes these methods in more detail.

### Character matchers

Character matchers are defined by simply typing the character for the desired phone. Character matchers will match any phone with the specified *base-character* - regardless of attached diacritics. Characters can be also be written using their unicode values.

**Table 23: Character matcher examples**

Expression	Matches
a	The vowel a
ba	The consonant b followed by the vowel a
\u0068	The consonant h

### Feature set matchers

Every IPA character can be described using a set of phonetic features. Feature set matchers are denoted by enclosing a list of feature names inside braces. Features contained within a phonex feature set matcher can be required (default) or

unwanted (prefixed by – (minus)). Feature names are case-insensitive and can be written using the full feature name or shorthand equivalent (e.g., {consonant} is the same as {c}).

**Table 24: Feature set matcher examples**

Expression	Matches
{consonant, All coronal consonants coronal}	
{c, – coronal}	All non-coronal consonants
{ }	Anything

## Regex matchers

Since IPA transcriptions are composed of unicode strings, regular expressions can also be used to match phones. To use a regex matcher, place the desired regular expression inside single quote characters.

**Table 25: Regex matcher examples**

Expression	Matches
'a'	The vowel a. Unlike the un-quoted version, 'a' will not match cases that have attached diacritics.
'[e-i]'	Characters in the range 'e' to 'i'.

## Phone class matchers

Phone class matchers combine several phone matchers into a 'class.' Phone classes are denoted by enclosing a set of phone matchers inside brackets. The phone class will match if any of the inner-matchers match. If the phone class starts with a – (minus) symbol, then the class will match any phone *not* matched by the inner-matchers.

**Table 26: Phone class examples**

Expression	Matches
[{glide}\v]	Any glide or vowel.
[^{\c,labial}]	Anything not a labial consonant or a vowel.

## Compound phone matchers

Compound phones are composed of two single-phones bi-sected by a ligature. To match compound phones in phonex, connect two phone matchers using a \_ (underscore) character.

**Table 27: Compound phone matcher examples**

Expression	Matches
t_{fricative}	Any compound phone starting with the consonant 't' and ending with a fricative.
._.	Any compound phone.

## Groups

Grouping in phonex 2.0.

Groups can be *capturing* or *non-capturing*. *Capturing* groups are numbered by counting the open parenthesis from left to right in the expression. *Non-capturing* groups do not count towards the group total. For example, in the expression `(h({v})) (?={c}+({-c}))` there are three groups:

1. `(h({v}))`
2. `{v}`
3. `{-c}`

Group zero is always the entire expression.

Back-references can be used to match content previously matched by the expression. A common example is to search for a repeated consonant (e.g., `({c})\1`) or syllable (e.g., `((c){v})\1`.) Content matched by a back-reference will *not* check syllable constituent type or stress, however plug-in matchers can be added to the back-reference like any other phone matcher.

Quantifiers can be applied to groups, and also affect the value stored in a group after matching. The following examples illustrate this.

**Table 28: Grouping Examples**

Expression	Input	Group Values after Match
<code>(\s?{c}{v})+</code>	zu'ki:ni	group 1 = ni
<code>((\s?{c}{v})+)</code>	zu'ki:ni	group 1 = zu'ki:ni, group 2 = ni
<code>((lastsyll=\s?{c}{v})+)</code>	zu'ki:ni	group 1 = zu'ki:ni, group 'lastsyll' = ni
<code>(?=(lastsyll=\s?{c}{v})+)</code>	zu'ki:ni	group 'lastsyll' = ni
<code>(cv1=\s?{c}{v})(cv2=\s?{c}{v})(cv3=\s?{c}{v})</code>	zu'ki:ni	group 'cv1' = zu, group 'cv2' = 'ki:, group 'cv3' = ni
<code>(cv1=\s?{c}{v})(rem=(?=\s?{c}{v})&lt;2&gt;)</code>	zu'ki:ni	group 'cv1' = zu, group 'rem' = 'ki:ni

## Boundaries

Description of special boundary markers.

Boundary markers perform special operations. Since they have the ability to match nothing, quantifiers and plug-in matchers cannot be applied to boundary matchers.

### **Beginning/End of Input**

The beginning and end of input characters ('^' and '\$' respectively) match exactly what their names imply and should only appear at the beginning/end of a phonex expression.

### **Word Boundaries**

Word boundaries detect and match the edges of words in the given input. Words boundaries are detected at the beginning/end of input as well as whitespace.

### **Syllable Boundaries**

Syllable boundaries detect and match the edges of syllables in the given input. Syllable boundaries are detected at the beginning/end of input, whitespace, ipa punctuation (stress, pauses, periods, etc.), and - if available - using syllabification information. When reading an input string from left to right, if a space and stress marker are adjacent then the syllable boundary will match *once* (i.e., only one syllable boundary is detected - not two.)

## **Quantifiers**

Description of phonex quantifiers.

Quantifiers modify the number of times a phone matcher or group can be repeated. Quantifiers are always applied to the preceding matcher or group. There are three types of quantifiers in phonex: *greedy*, *reluctant*, and *possessive*.

*Greedy* quantifiers are such called because they attempt to match the entire input on first match. If the match fails, the matcher backs off one phone at a time until a match is obtained or until the number of choices has been exhausted.

*Reluctant* quantifiers do the opposite; they will reluctantly process phones, only attempting a full input match as a last resort.

*Possessive* quantifiers never back off; they will always process as many phones as possible, never attempting to backtrack - even if doing so would allow the match to succeed.

To illustrate the difference between different quantifiers, consider the following examples using the input string: hello.

**Table 29: Greedy vs. Reluctant Quantifiers**

Expression	Finds
. * \v ( <i>greedy</i> )	1 occurrences - hello
. * ? \v ( <i>reluctant</i> )	2 occurrences - he, llo
. * + \v ( <i>possessive</i> )	0 occurrences since '.*+' initially matches the final 'o' in the input and will not backtrack

## **Look Ahead/Behind**

Look ahead/behind in phonex allows matching based on adjacent elements. The elements matched by the look ahead-behind groups will not be included in the returned value. Look ahead groups will start with the sequence (?> while look behind groups will start with the sequence (?<.

One case where this feature is useful is when searching for patterns medially within transcriptions. For example, to search for all word-medial consonants:

```
(?<\w) \c (?>\w)
```

This example has main parts:

1. `(?<\w)` *look behind* the current element and match if it is a consonant or vowel
2. `\c` match if the current element is a consonant
3. `(?>\w)` *look ahead* of the current element and match if it is a consonant or vowel

## Supplementary Matchers

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### Overview

Supplementary matchers in phonex 2.0.

One or more supplementary matchers can be attached to a phone matcher, separated by a `:` (colon). Each supplementary matcher may take zero or more arguments, defined by the supplementary matcher. The following sections describe the supplementary matchers provided with Phon.

### stress

Description of the phonex `stress` supplementary matcher.

The `stress` supplementary matcher will query the detected syllable stress of a phone. The argument given to the plug-in must be one of the following characters:

- 1 - primary stress
- 2 - secondary stress
- A - any stress
- U - unstressed

The `stress` matcher has a short-hand within phonex. The stress type may be specified after a `!` character after a phone matcher.

#### Onsets of primary stress syllables

```
.:sctype("Onset") :stress("1")
```

or

```
.:O!1
```

### sctype

Description of the phonex `sctype` supplementary matcher.

The `sctype` supplementary matcher queries the syllable constituent type of a phone. The expression given to the matcher must be a list of syllable constituent types from the following list, separated by a `|` (pipe.)

- `LeftAppendix` or L
- `Onset` or O
- `Nucleus` or N
- `Coda` or C
- `RightAppendix` or R
- `Ambisyllabic` or A

- OEHS or E
- SyllableStress or S
- SyllableBoundary or B
- WordBoundary or W
- Unknown or U

All constituent types are case-insensitive. Constituent types can also be prefixed by a – (minus) to indicate the constituent type is not-allowed.

The `sctype` matcher also has a shorthand within phonex. A single constituent type may be queried on a phone matcher by specifying one of the single-character codes shown above prefixed by a `:`.

Both of these expressions will search for 'b' in the onset position:

```
b:sctype("Onset")
```

or

```
b:o
```

## diacritic

Description of the phonex `diacritic` supplementary matcher.

The `diacritic` supplementary matcher queries the diacritic sections of a phone. It accepts a single parameter which can be either:

- A single character
- A feature set matcher
- A phone class matcher

The matcher will match if any of the diacritics of the phone match the provide argument. This matcher also has a short-hand within phonex, the argument provided may be specified by using the `&` character after a phone matcher.

Search for any phone that has a diacritic.

```
.:diacritic("{}")
```

or

```
.&.
```

Both of these expressions will search for any phone with the diacritics which add the `{labial}` or `{aspirated}` features.

```
.:diacritic("[{aspirated}{labial}]")
```

or

```
.&[{aspirated}{labial}]
```

## prefix

Description of the `prefix` supplementary matcher.

The `prefix` supplementary matcher queries the prefix section of a phone. It accepts a single parameter which can be either:

- A single character
- A feature set matcher
- A phone class matcher

The matcher will match if any of the diacritics of the phone match the provide argument.

Search for a phone with the prefix diacritic \u02b0

```
..:prefix("\u02b0")
```

## suffix

Description of the `suffix` supplementary matcher.

The `prefix` supplementary matcher queries the prefix section of a phone. It accepts a single parameter which can be either:

- A single character
- A feature set matcher
- A phone class matcher

The matcher will match if any of the diacritics of the phone match the provide argument.

Search for a phone with the suffix diacritic \u02b0

```
..:suffix("\u02b0")
```

## comb

Description of the `comb` supplementary matcher.

The `comb` supplementary matcher queries the combining diacritic section of a phone. It accepts a single parameter which can be either:

- A single character
- A feature set matcher
- A phone class matcher

The matcher will match if any of the combining diacritics of the phone match the given argument.

Search for a phone that has the combining diacritic \u0300

```
..:comb("\u0300")
```

## tone

Description of the `tone` supplementary matcher.

The `tone` supplementary matcher queries the detected tone of the phone. The superscript number diacritics for tone apply to all elements of a syllable. One argument is accepted denoting the allowed tones accepted, with multiple allowed values separated by a '|'. The numbers 1-9 may be used to identify tone type with '\*' being any tone.

Search for a cluster of phones with tone 1

```
..:tone("1") +
```

## Examples

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# Chapter 4

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## CHAT Support

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**Topics:**

- *Main Line Coding*

## Main Line Coding

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### Markers

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# Chapter

# 5

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## Queries

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### Topics:

- [\*Query Project\*](#)
- [\*Save Query Script\*](#)
- [\*Open Query Script\*](#)
- [\*Common Query Options\*](#)
- [\*Query: Data Tiers\*](#)
- [\*Query: Phones\*](#)
- [\*Query: Segmental Relations\*](#)
- [\*View Result Set\*](#)
- [\*View Query History\*](#)

## Query Project

---

Run a query for patterns across sessions in a project.

From the **Project Manager** or **Session Editor** window:

1. From the **Query** menu, select the type of query you would like to perform.  
This action generates a **Query Project** window.
2. Use the check boxes to select the entire project, one or more corpora, or one or more sessions for the query. From the available panels select options for your search as per the descriptions in the **Query Types** section of the user manual.
3. Choose whether to **Include excluded records** by selecting or deselecting that check box, and click the **Run Query** button.

This action will generate a **Results** tab, which calculates the number of results for each search and list the sessions searched; this is referred to as a *Result Set*.

 **Note:** To toggle between editing your script as a form or as a script, click the **Toggle script/form** button at the bottom right corner of the query.

4. To view an individual *Result Set*, double-click on it in the **Results** tab.  
A session will open with a **Results** window next to it.

 **Note:** To show only *Result Sets* with more than zero results, select **Hide empty result sets**. For further instructions on using the **Results** window, see [View Result Set](#) on page 119

5. To view your search results in your **Query History** later, you must save them. To do so, click **Save results**. Enter a name for your results, choose whether or not the results should be *Starred*, enter any desired comments and click **Ok**.  
The search will be saved inside the project folder, in the '*\_\_search*' directory, and can now be viewed using the **Query History** window.
6. To get a detailed report of the results, click the **Report** button at the top of the **Results** tab.

 **Note:** To merge all records with results into a single session, see [Derive Session](#) on page 22.

## Save Query Script

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Save your query script.

From the **Query Project** window:

1. Click **Save script as...** at the top of the form/script.  
A **Save Query** dialog will appear.
2. Enter a name for the query in the **Name** field, and choose whether or not to **Include current form setup** using the check box.  
By default, current form setup is included. This means that search parameters entered in the query form (rather than just the query script) will be saved.
3. Choose whether to **Save in user library**, **Save in project resources**, or **Save in another location...** and click **Save**.  
Queries saved in the user library will be accessible in the **Query** menu for all projects. Queries saved in project resources will be accessible in only the current project's **Query** menu. Queries saved in other locations will not be available as menu selections.
4. As you do further work on your script, click **Save script** (CMD/CTRL+S) to save your work.

## Open Query Script

---

Open a previously saved query so that you can edit or re-run it.

From the **Project Manager** window:

1. Select the **Query > Script Editor...** menu item.

This will open the **Query Project** window.

 **Note:** This window is also accessible by opening any query type in the **Query** menu.

2. Click the **Open script** button above the currently visible form/script.

A browse window will appear.

3. Locate and select the script file that you wish to open and click **Open**.

4. Edit and/or run the query script as desired. To save changes to the script, click **Save script** above the form/script.

## Common Query Options

---

### Group Options

Limit the results based on position or an expression defining the word group.

1. Open the **Group Filter** panel by clicking on its title bar.

2. To filter by group position, select the group positions you would like to search (i.e. singleton, initial, medial and/or final groups).

3. To filter by content, choose an **Expression Type** using the context menu.

4. Enter the expression you would like to search for in the **Expression** field.

 **Note:** A filter can be used to *exclude* results based on an expression defining the word group, depending on the filter expression. For example, you can use the following regular expression (where PATTERN is the pattern you wish to exclude):

```
^ (? : (?! PATTERN) . ) * $
```

5. Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.

 **Note:** **Case sensitive** is not applicable to **Phonex**, **Stress pattern**, or **CGV pattern** expressions.

### Aligned Group Options

You may also limit the results based on an expression defining an aligned word group in another tier.

From the **Aligned Group** section of the **Group Filter**:

1. Enter the name of the filter tier in the **Tier name** field.

2. Choose an **Expression Type** using the context menu.

3. Enter the expression you would like to filter with in the **Expression** field.

4. Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.

 **Note:** **Case sensitive** is not applicable to **Phonex**, **Stress pattern**, or **CGV pattern** expressions.

### Aligned Group Options

You may also limit the results based on an expression defining an aligned word group in another tier.

From the **Aligned Group** section of the **Group Filter**:

1. Enter the name of the filter tier in the **Tier name** field.

2. Choose an **Expression Type** using the context menu.

3. Enter the expression you would like to filter with in the **Expression** field.

4. Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.

 **Note:** **Case sensitive** is not applicable to **Phonex**, **Stress pattern**, or **CGV pattern** expressions.

## Word Options

Limit the results based on position or an expression defining the word.

1. Open the **Word Filter** panel by clicking on its title bar.
2. Select the **Search by word** check box.
3. To filter by word position, select the word positions you would like to search (i.e. singleton words; or initial, medial and/or final words in groups with multiple words).
4. To filter by content, choose an **Expression Type** using the context menu.
5. Enter the expression you would like to search for in the **Expression** field.



**Note:** A filter can be used to *exclude* results based on an expression defining the word group, depending on the filter expression. For example, you can use the following regular expression (where PATTERN is the pattern you wish to exclude):

```
^(?:(:?!PATTERN).)*$
```

6. Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.



**Note:** **Case sensitive** is not applicable to **Phonex**, **Stress pattern**, or **CGV pattern** expressions.

## Aligned Word Options

You may also limit the results based on an expression defining an aligned word in another tier.

From the **Aligned Word** section of the **Word Filter**:

1. Enter the name of the filter tier in the **Tier name** field.
2. Choose an **Expression Type** using the context menu.
3. Enter the expression you would like to filter with in the **Expression** field.
4. Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.



**Note:** **Case sensitive** is not applicable to **Phonex**, **Stress pattern**, or **CGV pattern** expressions.

## Aligned Word Options

You may also limit the results based on an expression defining an aligned word in another tier.

From the **Aligned Word** section of the **Word Filter**:

1. Enter the name of the filter tier in the **Tier name** field.
2. Choose an **Expression Type** using the context menu.
3. Enter the expression you would like to filter with in the **Expression** field.
4. Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.



**Note:** **Case sensitive** is not applicable to **Phonex**, **Stress pattern**, or **CGV pattern** expressions.

## Syllable Options

Limit the results based on position or an expression defining the syllable.

1. Open the **Syllable Filter** panel by clicking on its title bar.
2. Select the **Search by syllable** check box.
3. Choose whether to **Ignore results from truncated syllables** by selecting or deselecting the check box.
4. To filter by syllable position, select the syllable positions you would like to search (i.e. singleton syllables; or initial, medial and/or final syllables in words with multiple syllables).
5. To filter by syllable stress type, select the stress types you would like to search (i.e. primary stress, secondary stress, or unstressed syllables).
6. To filter by content, choose an **Expression Type** using the context menu.

- Enter the expression you would like to search for in the **Expression** field.



**Note:** A filter can be used to *exclude* results based on an expression defining the word group, depending on the filter expression. For example, you can use the following regular expression (where PATTERN is the pattern you wish to exclude):

```
^(?:(?!PATTERN).)*$
```

- Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.



**Note:** **Case sensitive** is not applicable to **Phonex**, **Stress pattern**, or **CGV pattern** expressions.

## Participant Filter

Limit the results based on participant information.

## Query: Data Tiers

The *Data Tiers* query allows searching within any record tier.

## Usage

- Enter the name of the tier in which you would like to search in the **Tier name** field.
- Choose an **Expression Type** using the context menu.

3. Enter the expression you would like to search for in the **Expression** field.
4. Choose whether or not your query should be **Case sensitive** and/or an **Exact match** using the check boxes.



**Note:** Case sensitive is not applicable to Phonex, Stress pattern, or CGV pattern expressions.

### Related tasks

[Group Options](#) on page 114

Limit the results based on position or an expression defining the word group.

[Word Options](#) on page 115

Limit the results based on position or an expression defining the word.

[Participant Filter](#) on page 116

Limit the results based on participant information.

## Query: Phones

The *Phones* query allows searching within the *IPA Target* and *IPA Actual* tiers.

The screenshot shows the 'Query Project' interface with the 'Phones' query selected. The left sidebar lists corpora: Demo Project, Anne, and Catootje. The main panel shows the 'Query : Phones' configuration:

- Search Tier:** IPA Target
- Search by:** Word (radio button selected)
- Expression type:** Phonex
- Expression:** Enter expression (text input field)
- Advanced Options:**
  - Case sensitive
  - Exact match
  - Allow overlapp

Below these are regex explanations:
 
  - . = any phone, \c or {c} = consonant, \v or {v} = vowel
  - :o = in onset, [\c\v] = consonant or vowel, '[bp]' = b or p (regex)
  - ^ = beginning of input, \$ = end of input
  - \* = zero or more, + = one or more, ? = zero or one
- Context Menu:** Aligned Phones, Group Options, Word Options, Syllable Options, Participant Filter
- Checkboxes:**  Include excluded records
- Buttons:** Run Query

## Usage

1. Select a **Search Tier** from the context menu (**IPA Target** or **IPA Actual**).
2. Select an **Expression Type** from the context menu (**Plain text**, **Regular expression**, **Phonex**, **Stress pattern**, or **CGV pattern**).

3. Enter a search expression in the **Expression** field, using the key at the bottom as a guide if applicable.
4. Choose whether your query should be **Case sensitive** or an **Exact match** by selecting or deselecting the check boxes.

#### Related tasks

[Group Options](#) on page 114

Limit the results based on position or an expression defining the word group.

[Word Options](#) on page 115

Limit the results based on position or an expression defining the word.

[Syllable Options](#) on page 115

Limit the results based on position or an expression defining the syllable.

[Participant Filter](#) on page 116

Limit the results based on participant information.

## Query: Segmental Relations

Look for segmental relations within phone alignment.

The screenshot shows the 'Segmental Relations' query configuration window within the 'Query Project' interface. The window title is 'Query : Segmental Relations'. On the left, there's a tree view of projects: 'Demo Project' expanded, showing 'Anne' and 'Catootje'. The main area contains several filter sections:

- Search by:** Radio buttons for 'Group' (unchecked) and 'Word' (checked). Below it is a checkbox for 'Then by syllable' (unchecked).
- Relations:** A list of checked checkboxes representing different segmental relations: Reduplication ( $X\emptyset \leftrightarrow XX$ ,  $X\dots\emptyset \leftrightarrow X\dots X$ ), Migration ( $X\dots Y \leftrightarrow \emptyset\dots X$ ,  $X\dots\emptyset \leftrightarrow \emptyset\dots X$ ), Metathesis ( $XY \leftrightarrow YX$ ,  $X\dots Y \leftrightarrow Y\dots X$ ), Harmony ( $X\dots Y \leftrightarrow X\dots X$ ), and Assimilation ( $XY \leftrightarrow XX$ ).
- Direction:** Radio buttons for 'Progressive' (checked) and 'Regressive' (checked).
- Locality:** Radio buttons for 'Local (XY)' (checked) and 'Nonlocal (X\dots Y)' (checked).
- Dimensions:** Radio buttons for 'Any selected dimension' (checked) and 'Require all selected dimensions' (unchecked).
- Consonants:** A checked checkbox for 'Include consonant relations'.
- Consonant Dimensions:** A section with a progress bar.

At the bottom left is a checkbox for 'Include excluded records' (unchecked). At the bottom right is a 'Run Query' button with a pencil icon.

## View Result Set

---

View a *Result Set* from a query.

From a **Results** tab in the **Query Project** window or from the **Query History** window with a query selected:

1. Double-click on a result set.

The **Results** window will open alongside the session in which the results were found. Each result will be displayed with its **Record #**, **Speaker**, **Result**, and any associated metadata.



**Note:** To open only the **Results** window, deselect **Open session with result set** before opening a result set.



**Note:** To arrange results by a certain column, click on its header. To reorder columns, click and drag their header to the left or right. To further change column view options, click on the icon to the right of the column headers.

2. To view a result in the **Session Editor**, click on it in the **Results** window.

The record in which the result was found will be displayed, with the result highlighted in the **Record Data** view.

3. To exclude an extraneous result from the list, select it and choose the **Results > Toggle result excluded** menu item or press Delete/Backspace. You can show or hide excluded results by selecting or deselecting **Show excluded results**.

4. To save any changes to a result set, click **Save**.

## Save Table as CSV

Save the table visible in the **Results** window as a CSV file.

From the **Results** window:

1. Click **Save table as CSV...**

A browse window will appear, prompting you to choose a file name and directory in which to save the table.

2. Choose a file name and directory for your table and click **Save**.

The table in the **Results** window will be saved as a CSV file in the chosen directory.



**Note:** If excluded records are currently visible, they will be included in the CSV file.

## Edit Table Columns

Add, remove, edit, or reorder columns currently visible in the **Results** window.

From the **Results** window:

1. Click the **Edit table columns...** button or choose the **Results > Edit table columns...** menu item.

This will open the **Edit Columns** dialog, which shows the current columns of the table and their options.

2. To add a column to the table, click **Add field.../+** and select a field name from the list. Alternatively, you may select **Custom** from the list to create a custom field.



**Note:** Creating a custom field may require some familiarity with Javascript.

3. To remove a column from the table, select it and click **Remove selected field/-** or press Delete/Backspace.

4. To re-order a column, select it and use the **up/down arrows** to move it higher or lower in the outline.

## Filter Results

Search within the results table.

From the **Results** window:

1. Enter your search term in the **Filter results** bar.

A list of all results containing your search term will be displayed, showing their **Record #**, **Speaker**, and **Result**. If there are no results, this list will be empty.

 **Note:** To search within a specific column (or multiple columns), click the drop down arrow to the left of the search bar and select it in the list. Options are also available to allow you to **Use regular expression** or to make your search **Case sensitive**.

2. To clear the **Search** bar, click **Clear field/X**.

### About Table Quick Search

In this type of search field, the following syntax is accepted:

```
[<column>(<column>)*:]<expr>(; [<column>(<column>)*:]<expr>)*
```

Possible elements:

- **<column>**  
The name of a column in the displayed table.
- **<expr>**  
Either a regular expression (regex), a phone sequence expression (phonex) or plain text.

Some example expressions:

**Table 30:**

Expression	Matches
b	Any row with a column that contains 'b'
Speaker:Anne; b	Any row where column 'Speaker' is 'Anne' and any other column contains 'b'
IPA Target:b{v}	Any row where the IPA Target column contains 'b' followed by a vowel
IPA Target,IPA Actual:k{v}	Any row where either the IPA Target or the IPA Actual column contains 'k' followed by a vowel
Orthography:c; IPA Target:{c} {g}	Any row where the Orthography column contains 'c' and IPA Target contains a consonant followed by a glide.

## View Query History

---

View the query history for a project.

From within a project:

1. Select the **Query > Query History...** menu item.

The **Query History** window will appear, with a list of your saved queries on the left.

 **Note:** To arrange the listed queries by **Date**, **Name**, or **# of Result Sets**, click on the appropriate column header. To further change column view options, click on the icon to the right of the column headers.

2. Select a query from the list to view its *Info* and *Results*.

From here, you will have options to open the selected query, view result sets, or generate a report.

3. Double-click a result set to open it.

By default, this will open a **Results** window alongside the session in which those results were found. When the session is closed, the **Results** window will close too. To open only the **Results** window, deselect **Open session with result set**.

 **Note:** To list only result sets which contain results, select **Hide empty result sets**.

4. To open the selected query for further editing, click **Open Query**, and edit and run your query as desired. To generate a report, click **Report**.

## Delete Query from History

Delete a query from the **Query History**.

From the **Query History** window:

1. Right-click (CTRL+click) on the query you wish to delete and select **Delete** from the context menu. Alternately, select the query you wish to delete and press Delete/Backspace.  
A dialog will appear asking you to confirm that you would like to delete the query.
2. If you are unsure, click **Cancel**. To continue and delete the query, click **Ok**.  
The query will no longer appear in the **Query History** window.

## Edit Query Details

Edit a query's name, contents, and/or star setting.

From the **Query History** window:

1. Right-click (CTRL+click) on a query in the list and choose **Edit details...**  
This will open a **Query Details** dialog.
2. Click the star to the left of the query's name to set or unset *Starred*. Edit **Name** and **Comments** as desired, and click **Ok**.  
Updated details will be reflected in the query's *Info*.

## About Starred Queries

Any important or noteworthy query in the **Query History** window can be set to starred. This allows you to view all/only important queries at once.

To set a query to *Starred*, right-click (CTRL+click) on it in the **Query History** window and choose **Set starred**, or select the query and click the star to the left of its name in the *Info* field.

To unstar a previously starred query, right-click (CTRL+click) on it and choose **Set unstarred**, or select the query and click the star to the left of its name in the *Info* field.

To view only *Starred* queries, click the **star** at the top left corner of the list of queries.

---

# Chapter

# 6

---

## Query Reports

---

### Topics:

- *Report: Aggregate (IPA results)*
- *Report: Aggregate (non-IPA results)*
- *Report: Inventory by Session (IPA results)*
- *Report: Inventory by Session (non-IPA results)*
- *Report: Listing*
- *Report: Listing by Session*
- *Report: Phone Dispersion*
- *Report: Transcript Variability*
- *Report: Query Information*
- *Acoustic Data Reports*
- *Custom Reports using Composer (simple)*

## **Report: Aggregate (IPA results)**

---

The *Aggregate (IPA results)* query report will produce an aggregate inventory table for results from IPA tiers. Items in the table will be sorted phonetically.

### **Example**

If the given query results contain both *IPA Target* and *IPA Actual* columns the inventory is calculated for aligned pairs. Each session sampled in the query will have a column in the inventory table.

## **Report: Aggregate (non-IPA results)**

---

Create an aggregate inventory of non-IPA results. This inventory will be calculated based on the 'Result' column of query results. Items in the table will be sorted by the Result column alphabetically.

### **Example**

Each session sampled in the query will have a column in the inventory table.

## **Report: Inventory by Session (IPA results)**

---

Display an inventory of IPA results for each sampled session. A separate table is displayed for each session. Items in the table are sorted by phonetically.

### **Example**

If the given query results contain both *IPA Target* and *IPA Actual* columns the inventory is calculated for aligned pairs.

## **Report: Inventory by Session (non-IPA results)**

---

Display an inventory of non-IPA results for each sampled session. A separate table is displayed for each session. Items in the table are sorted alphabetically.

### **Example**

## **Report: Listing**

---

This report will list each query result in a table. Results from all sampled sessions will be included in a single table. Any tiers specified in the 'Aligned Group', 'Aligned Word', 'Add aligned group', and 'Add aligned word' fields of the query will also be listed in the table.

### **Example**

Columns included in the output table:

- Session
- Speaker
- Record #
- Result
- Any other tiers specified in the query

## Report: Listing by Session

---

This report will list each query result in a table. A separate table will be displayed for each sampled session. Any tiers specified in the 'Aligned Group', 'Aligned Word', 'Add aligned group', and 'Add aligned word' fields of the query will also be listed in the table.

### Example

Columns included in the output table:

- Speaker
- Record #
- Result
- Any other tiers specified in the query

## Report: Phone Dispersion

---

## Report: Transcript Variability

---

## Report: Query Information

---

Display query name and parameters.

### Example

## Acoustic Data Reports

---

Acoustic data reports print acoustic information for each query result.

All acoustic data reports require identification of one or more intervals in the audio for analysis. Intervals are selected using one of the following methods:

- The full segment for the record of the query result
- Intervals from a specific TextGrid tier
  - When using this option, a result line will be printed for each interval of the specified TextGrid tier which is included in the full record segment
  - TextGrid intervals may be filtered by their label using a regular expression
- Intervals from a result column in the query result (typically a tier name)
  - TextGrid mappings must exist between the specified tier and a TextGrid tier
  - This is the default option with the tier name set as IPA\_Actual

**Interval for Analysis**

Use full record segment

Use intervals from TextGrid tier

Enter TextGrid tier name

Enter interval filter (leave empty to select all)

Use interval for tier/column value

IPA Actual

If an interval cannot be selected for a query result, no information will be printed in the report.

## Report: Duration

Print duration of each selected TextGrid interval.

### Example

Report table will have the following columns:

- Session
- Speaker
- Record #
- Result/Tier Name
- Additional tiers added to query results
- Start Time (s)
- End Time (s)
- Duration (s)

Session	Record #	IPA Actual	Start Time	End Time	Duration
Anne.Session	2	i:	4.54	5.08	0.54
Anne.Session	2	u:	6.44	6.71	0.27
Anne.Session	2	u:	6.98	7.26	0.27
Anne.Session	2	ɔ:	7.26	7.8	0.54
Anne.Session	2	i:	8.07	8.34	0.27
Anne.Session	4	ɛ	10.2	10.42	0.22
Anne.Session	7	u:	12.96	13.31	0.35
Anne.Session	9	ɛ	14.79	15.22	0.43
Anne.Session	9	ɔ:	15.22	15.65	0.43
Anne.Session	9	i:	15.87	16.08	0.22
Anne.Session	9	ɪ:	16.08	16.66	0.57
Anne.Session	9	ɪ	16.85	17.04	0.19
Anne.Session	9	ʌ	17.38	17.52	0.14
Anne.Session	11	æ	19.83	20.12	0.28
Anne.Session	14	æ	23.81	24.17	0.36
Anne.Session	17	ə	28.73	28.98	0.25
Anne.Session	17	ʌ	29.11	29.23	0.13

Session	Record #	IPA Actual	Start Time	End Time	Duration
Anne.Session	17	e	29.36	29.49	0.13
Anne.Session	17	e	29.61	29.74	0.13
Anne.Session	17	i	29.74	29.87	0.13
Anne.Session	19	æ	31.49	31.89	0.41
Anne.Session	19	ə	32.03	32.16	0.14
Anne.Session	19	ɔ	32.43	32.57	0.14

## Report: Intensity

Display intensity values (dB) at various positions within each selected TextGrid interval.

### Example

Session	Record #	IPA Actual	Start Time	End Time	I10(dB)	I20(dB)	I30(dB)	I40(dB)	I50(dB)	I60(dB)	I70(dB)	I80(dB)	I90(dB)
		#	Actual Time										
Anne.Session	1:	i:	4.54	5.08	68.41	66.99	67.3	68.05	67.87	67.29	66.48	66.04	61.31
Anne.Session	u:	u:	6.44	6.71	69.57	68.5	67.2	66.44	65.71	64.77	65.57	67.92	69.06
Anne.Session	u:	u:	6.98	7.26	67.46	68.69	68.58	67.55	67.98	70.6	72.03	71.5	70.42
Anne.Session	ɔ:	ɔ:	7.26	7.8	69.37	66.01	66.97	68.76	71.86	72.49	70.36	67.92	67.71
Anne.Session	i:	i:	8.07	8.34	68.76	67.9	67.16	66.24	65.67	64.05	63.36	9.22337902368372076854776E	
Anne.Session	ɛ	ɛ	10.2	10.42	61.32	60.84	61.74	62.44	62.82	62.7	62.64	9.22337902368372076854776E	
Anne.Session	u:	u:	12.96	13.31	69.14	68.93	66.74	64.22	68.98	71.93	68.92	66.63	9.22337902368372036854776E
Anne.Session	ɛ	ɛ	14.79	15.22	67.77	69.43	69.56	70.1	67.44	70.17	74.43	72.25	68.15
Anne.Session	v:	v:	15.22	15.65	67.52	69.2	70.68	71.89	69.09	66.64	64.5	63.06	61.33
Anne.Session	i:	i:	15.87	16.08	63.68	66.27	69.28	68.82	67.81	68.4	68.89	68.79	68.05
Anne.Session	ɪ:	ɪ:	16.08	16.66	68.67	69.38	67.18	66.11	65.23	61.78	62.0	67.37	63.98
Anne.Session	i	i	16.85	17.04	62.68	62.58	62.87	63.56	64.01	64.09	63.92	63.33	63.98
Anne.Session	ʌ	ʌ	17.38	17.52	69.04	68.03	67.87	67.74	67.13	66.75	67.15	68.1	68.83
Anne.Session	æ	æ	19.83	20.12	66.79	66.75	66.37	67.14	67.76	66.39	64.35	9.22337902368372076854776E	
Anne.Session	æ	æ	23.81	24.17	68.67	65.43	67.3	68.08	67.02	68.19	68.11	68.81	9.22337902368372036854776E
Anne.Session	ə	ə	28.73	28.98	72.41	71.16	70.72	69.77	68.92	68.07	66.37	63.74	63.31
Anne.Session	ʌ	ʌ	29.11	29.23	66.32	66.45	66.25	65.86	65.56	65.72	65.76	65.84	65.92
Anne.Session	e	e	29.36	29.49	62.36	63.18	63.79	63.88	63.37	63.07	63.01	63.13	63.31
Anne.Session	e	e	29.61	29.74	61.91	62.41	62.5	62.21	61.38	60.32	59.31	58.63	59.06
Anne.Session	i	i	29.74	29.87	61.29	62.17	62.6	64.41	66.25	67.31	67.1	65.54	63.99
Anne.Session	æ	æ	31.49	31.89	68.36	70.62	67.7	65.08	61.55	60.66	63.24	63.28	66.12
Anne.Session	ə	ə	32.03	32.16	68.9	69.55	69.65	69.46	69.39	69.5	69.09	68.84	68.8
Anne.Session	ɔ	ɔ	32.43	32.57	68.33	66.81	65.09	64.0	63.16	62.93	63.96	66.44	68.55

## Report: Pitch

Display pitch values at various points within each selected TextGrid interval.

## Example

# Report: Formants

Display formant values at various points within each selected TextGrid interval.

## Example

Session	Record #	IPA	Start Time(s)	End Time(s)	Center of Gravity	Standard Deviation	Kurtosis	Skewness
	# Adjective							
Anne.Session1	i:	4.54	5.08	6546.1	2949.07	-1.14	0.04	
Anne.Session1	u:	6.44	6.71	4159.59	2113.1	1.07	1.26	
Anne.Session1	u:	6.98	7.26	6705.97	2879.53	-1.01	0.17	
Anne.Session1	ɔ:	7.26	7.8	5743.46	3006.35	-1.31	0.29	
Anne.Session1	i:	8.07	8.34	4537.78	2264.81	-0.14	0.85	
Anne.Session1	ɛ	10.2	10.42	5646.43	3392.38	0.13	1.11	
Anne.Session1	u:	12.96	13.31	7882.47	2736.01	-0.31	-0.02	
Anne.Session1	ɛ	14.79	15.22	3847.37	1359.33	8.06	2.32	
Anne.Session1	v:	15.22	15.65	3432.48	1963.14	2.41	1.59	
Anne.Session1	i:	15.87	16.08	7366.5	2620.64	0.54	0.79	

## Report: Spectral Moments

Display Center of Gravity, Standard Deviation, Kurtosis, Skewness for each selected TextGrid interval.

### Example

Session	Record #	IPA	Actual	Start Time(s)	End Time(s)	Center of Gravity	Standard Deviation	Kurtosis	Skewness
Anne.Session1	i:	4.54	4.54	4.54	5.08	6546.1	2949.07	-1.14	0.04
Anne.Session1	u:	6.44	6.44	6.44	6.71	4159.59	2113.1	1.07	1.26
Anne.Session1	u:	6.98	6.98	6.98	7.26	6705.97	2879.53	-1.01	0.17
Anne.Session1	ɔ:	7.26	7.26	7.26	7.8	5743.46	3006.35	-1.31	0.29
Anne.Session1	i:	8.07	8.07	8.07	8.34	4537.78	2264.81	-0.14	0.85
Anne.Session1	ɛ	10.2	10.2	10.2	10.42	5646.43	3392.38	0.13	1.11
Anne.Session1	u:	12.96	12.96	12.96	13.31	7882.47	2736.01	-0.31	-0.02
Anne.Session1	ɛ	14.79	14.79	14.79	15.22	3847.37	1359.33	8.06	2.32
Anne.Session1	v:	15.22	15.22	15.22	15.65	3432.48	1963.14	2.41	1.59
Anne.Session1	i:	15.87	15.87	15.87	16.08	7366.5	2620.64	0.54	0.79

Session	Record #	IPA Actual	Start Time(s)	End Time(s)	Center of Gravity	Standard Deviation	Kurtosis	Skewness
Anne.Session9	I:	16.08	16.66	7165.74	1926.63	1.78	0.92	
Anne.Session9	I	16.85	17.04	8172.14	3930.62	-1.47	0.07	
Anne.Session9	ʌ	17.38	17.52	6473.96	1612.24	4.6	1.36	
Anne.Session11	æ	19.83	20.12	6668.93	2066.19	0.67	0.29	
Anne.Session14	æ	23.81	24.17	5673.13	1969.05	2.92	1.36	
Anne.Session17	ə	28.73	28.98	4538.59	2827.67	1.13	1.26	
Anne.Session17	ʌ	29.11	29.23	3527.72	2390.15	7.31	2.75	
Anne.Session17	e	29.36	29.49	5201.4	2846.73	0.09	0.92	
Anne.Session17	e	29.61	29.74	4050.71	1753.09	7.91	2.58	
Anne.Session17	i	29.74	29.87	4856.55	2954.73	1.42	1.49	
Anne.Session19	æ	31.49	31.89	5843.73	3799.92	-0.82	0.8	
Anne.Session19	ə	32.03	32.16	3061.92	1397.28	18.45	3.48	
Anne.Session19	ɔ	32.43	32.57	4158.31	2144.43	9.64	2.92	

## Report: VoT

The voice onset time (VoT) report will calculate VoT for each query result.

### Parameters

- *VoT Tier* TextGrid tiername for the VoT point tier (default 'VoT')

### Data preparation

This report requires the use of TextGrid intervals. A TextGrid must be assigned to the session and tier mappings setup for the Phon tier used in the query. A point tier (default name 'VoT') must exist, with a point for each interval for which VoT calculation will be performed. The label of the point should match that of the related interval.

### VoT Calculation

Given a TextGrid interval, T, and a point, P, VoT is calculated as:

- $\text{VoT} = \text{P} - \text{T.end}$

### Example

The table produced will have the following columns:

- Session
- Speaker
- Record #
- Result/Tier name
- Start (s)
- End (s)
- Duration (s)
- VoT Point (s)
- VoT (s)

## **Custom Reports using Composer (simple)**

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# Chapter

# 7

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## Analyses

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**Topics:**

- *Analysis: PPC*
- *Analysis: Phone Inventory*
- *Analysis: Consonants*
- *Analyses: Phonological Processes*
- *Analysis: Phonological Mean Length of Utterance (PMLU)*
- *Analysis: Vocaliztion*
- *Analysis: Word List*
- *Analysis: Word Match*
- *Analysis: Multisyllabic Nonlinear Analysis*
- *Analysis: Word-level Analysis of Polysyllables (WAP)*
- *Custom Analysis using Composer (simple)*

## Analysis: PPC

---

The PPC analysis will calculate the percent phones/consonants/vowels correct (PPC/PCC/PVC) in the sampled data.

### Report Outline

The report will be composed of two types of tables:

- PPC Summary
- PPC Listing

An example table of contents is displayed below. Bold level elements are section headers while italic items are one of the tables listed above. Other headings are standard Phon report elements or text blocks.

- **PPC/PCC/PVC**
  - Parameters
  - **Summary**
    - *PPC Summary* (All Participants)
    - *PPC Summary* (Participant 1)
    - ...
  - **Breakdown**
    - *PPC Listing* (Participant 1)
    - ...

### Data Preparation

Session data is queried by word for each IPA Target and IPA Actual tuple. Proper syllabification and phone alignment is required for accurate results. All participants should have unique names/identification numbers and a speaker should be assigned to all records.

### Parameters

#### PPC Summary

The *PPC Summary* tables display # Target, # Correct, # Substituted, # Deleted, # Epenthesis, PPC/PCC/PVC (Percent Phone/Consonant/Vowel Correct) for the sampled data. When displaying the summary for "All Participants" each row is the summary for a single speaker with a final row displaying totals for all speakers. When displaying the summary for a participant, each row shows the totals for the participant in the indicated session. The caption of the table will be "All Participants" or "Participant Name".

Example (All Participants)

Speaker	Role	# Target	# Correct	# Substituted	# Deleted	# Epenthesized	PCC
CHI	Target Child	1202	700	265	237	64	55.29
Kiddo	Target Child	249	168	60	21	16	63.4
Total		1451	868	325	258	80	56.69

Example (Participant)

Session	Role	Age	# Target	# Correct	# Substituted	# Deleted	# Epenthesized	PCC
CHI.SessionTarget Child		01;10.11	321	165	68	88	17	48.82
CHI.SessionTarget Child		01;11.22	445	254	106	85	30	53.47
CHI.SessionTarget Child		02;02.15	436	281	91	64	17	62.03

## PPC Listing

The *PPC Listing* table displays # Target, # Correct, # Substituted, # Deleted, # Epenthesis, PCC/PVC (Percent Consonant/Vowel Correct) for each word sampled. The table will have the caption “Participant Name”.

Example

Record #	IPA Target	IPA Actual	# Target	# Actual	# Correct	# Substituted	# Deleted	# Epenthesized	PCC
1	'eɪs	'ɛi	1	1	0	0	1	1	0.0
1	'eɪs	?œys	1	2	1	0	0	1	50.0
2	'ent	'eɪn	2	1	1	0	1	0	50.0
3	'voχəl	'ho·ka	3	2	0	2	1	0	0.0
4	'blumə	'bo:mɪ	3	2	2	0	1	0	66.67
5	'sənfjəs	'tɪ:tæ	4	2	0	2	2	0	0.0
6	'fœys	'hœis	2	2	1	1	0	0	50.0
7	'fœys	'hœys	2	2	1	1	0	0	50.0
8	'kɪkər	'kikä	3	2	2	0	1	0	66.67
9	'klɔk	'kɔt	3	2	1	1	1	0	33.33
10	'sχunə	'u:mi	3	1	0	1	2	0	0.0
11	'sχun	'u:m	3	1	0	1	2	0	0.0
12	'pus	'pys	2	2	2	0	0	0	100.0
13	'nɔχ	'nɔkə	2	2	1	1	0	0	50.0
13	ən	əm	1	1	0	1	0	0	0.0
13	'pus	'pys	2	2	2	0	0	0	100.0
14	'paɪt	'pa:t	3	2	2	0	1	0	66.67
15	'vis	'his	2	2	1	1	0	0	50.0
16	'vis	'hɪs	2	2	1	1	0	0	50.0
17	'vərm	'vo:,mɪn	3	3	2	0	1	1	50.0
18	'nits	'n:t	3	2	2	0	1	0	66.67
19	'oto	'o:to	1	1	1	0	0	0	100.0
20	'bran ,tveɪ,oto	'bɑ:nt 'ctʌ	7	4	4	0	3	0	57.14
21	'aɪ,bɛi	'?a:,'bɛi	2	2	1	0	1	1	33.33

Record #	IPA Target	IPA Actual	# Target	# Actual	# Correct	# Substituted	# Deleted	# Epenthesized	PCC
22	.indí'jan	'ha:ní	4	2	1	0	3	1	20.0

## Analysis: Phone Inventory

---

The Phone Inventory analysis will calculate independent phoneme inventories of the *IPA Target* and *IPA Actual* tiers in the sampled data.

### Outline

The report will be composed of the following types of tables:

- Summary
- Aggregate Inventory
- Session Inventory

## Analysis: Consonants

---

### Outline

The report will be composed of four types of tables:

1. Singletons Summary
2. Clusters Summary
3. Singletons Listing
4. Clusters Listing

An example table of contents is displayed below. Bold level elements are section headers while italic items are one of the tables listed above. Other headings are standard Phon report elements or text blocks.

- **Consonants**
  - Parameters
  - **Summary**
    - *Singletons Summary* (All Participants)
    - *Cluster Summary* (All Participants)
  - **Singletons**

## TODO ##

### Data Preparation

Proper syllabification and phone alignment is required for accurate results. All participants should have unique names and a speaker should be assigned to all records.

### Singletons Summary

The *Singletons Summary* table classifies singleton consonants in different syllable and word positions as being Correct, Substituted, Distorted, or Deleted. Syllable positions are onset, coda, ambisyllabic, and oehs. (LAs and RAs should in theory never appear in syllable outside of clusters.)

Example:

**Clusters Summary****Singletons Listing****Clusters Listing****Analyses: Phonological Processes**

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**Analysis: Phonological Mean Length of Utterance (PMLU)**

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The PMLU analysis calculates

1. Phonlogical Mean Length of Utterance (PMLU) (Ingram 2002)
2. Expanded Phonological Mean Length of Utterance (ePMLU) (Arias & Lleó 2013)

**Outline****Analysis: Vocalization**

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**Analysis: Word List**

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**Analysis: Word Match**

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**Analysis: Multisyllabic Nonlinear Analysis**

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This document describes the Multisyllabic Nonlinear Analysis (MNA) report in Phon.

**Information**

TODO - Information about analysis and citations which will be included at the top of the report

**Organization**

The report will consist of two types of tables:

- MNA Production - breakdown of each word sampled
- MNA Summary - summary of all words sampled

An example tables of contents is displayed below. Bold level elements are section headers, italic items are one of the tables listed above. Other headings are standard Phon report elements or text blocks.

- **Multisyllabic Nonlinear Analysis**
  - Information
  - Parameters
  - **Summary**
    - *MNA Summary*
  - **Breakdown**
    - **Word /IPA Target/ (Word 1)**

- *MNA Production* (Production 1)
- *MNA Production* (Production 2)
- ...
- **Word /IPA Target/** (Word 2)
- ...

## Data Preparation

Session data is queried by word and a WAP Table is produced for each Orthography, IPA Target, and IPA Actual triad. Proper syllabification and phone alignment is required for accurate results. All participants should have unique names/identification numbers and a speaker should be assigned to all records.

## Parameters

Parameters for the initial *Data Tiers* query will be available. The user may modify the query parameters to adjust the set of words sampled.

## MNA Production Table

The *MNA Production* tables provide details for each word sampled. The table has four main categories: *Stress*, *Syllable*, *Phone/Timing Unit*, and *Feature*. Caption for the table will be "/IPA Actual/".

Example

/kʰæʃ'wɛʒəʃʊ:/

Category	Description	Value	Total
Stress	Primary Stress mis-match	1	
	Secondary Stress mis-match	1	
	Word stress mis-match: 12UU ↔ 21UU	1	
	Stress subtotal		3
Syllable	Syllable subtotal		0
Phone/Timing Unit	Phone 9 deleted: t ↔ Ø	1	
	Phone/Timing Unit subtotal		1
Feature	Place substitution {alveolar} ↔ {labial, - dental}: i ↔ w	1	
	Manner substitution {rhotic} ↔ {glide}: i ↔ w	1	
	Manner substitution {affricate} ↔ {fricative}: dʒ ↔ ʒ	1	
	Height substitution {high} ↔ {mid}: i ↔ ə	1	
	Backness substitution {front} ↔ {central}: i ↔ ə	1	

Category	Description	Value	Total
	Place substitution {alveolar} ↔ {alveopalatal}: s ↔ ſ	1	
	Height substitution {mid} ↔ {high}: ə ↔ ʊ:	1	
	Backness substitution {central} ↔ {back}: ɔ ↔ ʊ: ...ʃ...dʒ... → ...ʃ...ʒ...	1	
	Progressive Harmony Manner		
	Feature subtotal	9	
Total		13	

### Stress

The *Stress* category includes three checks, 1 point is added for each check that fails.

1. Primary Stress match
2. Secondary Stress match
3. Stress pattern match (full-word)

### Syllable

The *Syllable* category will add a point for each deleted or inserted syllable.

### Phone/Timing Unit

The *Phone/Timing Unit* category will add a point for each delete or inserted phone.

### Feature

The *Feature* category will displays substitutions found in the phone alignment. A point is added for substituted dimension found. Consonant dimensions include: place, manner, voicing. Vowel dimensions included: height, backness, tenseness (rounding is included for schwa.) Deleted/inserted phones are not included.

Any *Segmental Relations* (e.g., harmony/metathesis) detected will be also be displayed in this category. The value added for any segmental relation will be the number of dimensions (i.e., place/manner/voicing) involved in the relation.

## MNA Summary Table

The *MNA Summary* table displays totals for each word sampled.

Example

Word	Productions	Stress Subtotal	Syllable Subtotal	Phone/Timing Unit Subtotal	Feature Subtotal	Total
alligator	2	0.0	0.0	0.5	3.0	3.5
animal	2	0.5	0.5	1.5	4.5	7.0
balloons	2	1.0	0.5	0.5	3.0	5.0
cashregister	4	1.0	0.25	1.25	7.0	9.5

Word	Productions	Stress Subtotal	Syllable Subtotal	Phone/Timing Unit Subtotal	Feature Subtotal	Total
computer	2	0.0	0.0	0.5	3.0	3.5
electric	4	0.5	0.0	0.5	4.75	5.75
explodes	3	0.0	0.0	1.67	4.33	6.0
giraffe	2	2.0	1.0	1.5	2.0	6.5
gorilla	2	1.5	0.5	0.5	3.5	6.0
guitar	2	1.0	0.0	0.5	5.0	6.5
hippopotamus	2	1.0	0.0	0.5	3.5	5.0
hospital	2	0.0	0.0	0.5	7.0	7.5
invitation	3	1.0	0.33	1.67	5.0	8.0
magician	2	1.0	0.0	0.5	8.0	9.5
mosquito	2	0.0	0.0	1.0	4.0	5.0
skeleton	2	0.5	0.5	0.5	4.0	5.5
thermometer	3	0.33	0.33	1.33	4.67	6.67
umbrella	2	0.0	0.0	0.0	1.5	1.5
vegetable	3	0.0	0.0	1.0	6.33	7.33
watermelon	3	0.67	0.67	1.0	4.33	6.67

## Analysis: Word-level Analysis of Polysyllables (WAP)

This document outlines the Word-level Analysis of Polysyllables (WAP) report in Phon.

### Information

The WAP (Masso, 2016) was developed in 2016 and originally published as a supplementary appendix to Masso, McLeod, Baker, McCormack (2016). The published, manual version of the WAP included seven error categories: (1) Substitution of consonants or vowels, (2) Deletion of syllables, consonants or vowels, (3) Distortion of consonants or vowels, (4) Addition of consonants or vowels, (5) Alteration of phonotactics, (6) Alteration of timing and (7) Assimilation and/or alteration of sequence. Categories 1, 2, 3 and 4 were based on the SODA analysis (substitution, omission, distortion, addition) by van Riper (1939) and categories 1, 2, 5, 6 and 7 were informed by James' (2006) work on polysyllable acquisition. Through the development of the WAP within Phon, the categories have been re-defined and embedded into the WAP analysis available in Phon.

### Citations:

- Masso, S. (2016). Word-Level Analysis of Polysyllables. Sydney, Australia: Author.
- Masso, S., McLeod, S., Baker, E., & McCormack, J. (2016). Polysyllable productions in preschool children with speech sound disorders: Error categories and the Framework of Polysyllable Maturity. International Journal of Speech-Language Pathology, 18(3), 272-287. doi:10.3109/17549507.2016.1168483

### Outline

The report will be composed of the following tables types:

- Word Level Stress Inventory
- Word Level Accuracy

- Prosodic Level CGV Inventory
- Prosodic Level Stress Inventory
- Prosodic Level Breakdown
- Segmental Level Inventory
- Segmental Level Breakdown
- WAP Tables (Word/Prosodic/Segmental Level breakdown for each word in sample)

An example tables of contents is displayed below. Bold level elements are section headers, italic items are one of the tables listed above. Other headings are standard Phon report elements or text blocks.

- **Word-level Analysis of Polysyllables**
- Information
- *Word Level Stress Inventory* (All Participants)
- *Word Level Accuracy* (All Participants)
- *Prosodic Level CGV Inventory* (All Participants)
- *Prosodic Level Stress Inventory* (All Participants)
- *Prosodic Level Breakdown* (All Participants)
- *Segmental Level Inventory* (All Participants)
- *Segmental Level Breakdown* (All Participants)
- **Participant**
  - *Word Level Stress Inventory* (Participant)
  - *Word Level Accuracy* (Participant)
  - *Prosodic Level CGV Inventory* (Participant)
  - *Prosodic Level Stress Inventory* (Participant)
  - *Prosodic Level Breakdown* (Participant)
  - *Segmental Level Inventory* (Participant)
  - *Segmental Level Breakdown* (Participant)
- **Session 1**
  - *Word Level Stress Inventory* (Participant)
  - *Word Level Accuracy* (Participant)
  - *Prosodic Level CGV Inventory* (Participant)
  - *Prosodic Level Stress Inventory* (Participant)
  - *Prosodic Level Breakdown* (Participant)
  - *Segmental Level Inventory* (Participant)
  - *Segmental Level Breakdown* (Participant)
  - **Word 1 /IPA Target/ -> /IPA Actual/**
    - *Word Level*
    - *Prosodic Level*
    - *Segmental Level*
  - ...
  - ...
  - ...

## Data Preparation

Session data is queried by word and a WAP Table is produced for each Orthography, IPA Target, and IPA Actual triad. Proper syllabification and phone alignment is required for accurate results. All participants should have unique names/identification numbers and a speaker should be assigned to all records.

## Word Level Inventory and Accuracy Tables

The *Word Level Stress Inventory* tables displays counts of the whole word stress productions (Target→Actual) in the sample.

Example:

IPA Target	IPA Actual	Count
1U2	1U2	4
1U2U	12U	1
1U2U	1U2U	4
1U2U	U1U	1
1UU	1UU	5
2U1	2U1	1
2U1U	2U1U	1
2U1UU	2U1UU	1
U12	12	2
U1U	1U	3
U1U	U1U	5
U1UU	U1UU	1
UUU1U	UU1U	1

The *Word Level Accuracy* table displays counts of whole word analyses in the five dimensions listed below. Caption for the table will be “Word Level Accuracy” followed by either “(Session)” or “(Participant)” or “(All Participants)”.

*Word Level Accuracy* dimensions and definitions:

- **Word** (whole word accuracy). The total number of words that were produced correctly, incorrectly, and the percentage of words produced correctly.
- **# Syllables** (word length correct). The total number of words that were produced with the correct number of syllables; an incorrect number of syllables; and the percentage of words with correct length.
- **Stress** (lexical stress correct). The total number of words that were produced with the correct lexical stress (all syllables produced with the correct stress); number produced with incorrect lexical stress; and the percentage of words with the correct lexical stress.
- **CGV Shape** (target and actual CV shape with syllable stress, boundaries, and length included). The total number of words that were produced with the correct CGV shape (regardless of the accuracy of the segments); number produced with incorrect CGV shape; and the percentage of words with correct CGV shape.
- **# Transitions** (syllable transitions correct): The total number of syllable transitions produced in the sample (total number of syllables – 1 for each word produced); the total number of segregated syllable transitions (number of intra-word pauses in target and actual); and the percentage of correct syllable transitions (correct transitions / segregated transitions + correct transitions\*100).

Example:

Category	Correct	Incorrect	% Correct
Word	2	28	6.67
# Syllables	22	8	73.33
Stress	22	8	73.33
CGV Shape	5	25	16.67

Category	Correct	Incorrect	% Correct
# Transitions	63	9	87.5

## Prosodic Level Inventories and Breakdown Tables

The prosodic level inventories and breakdown tables display prosodic level information from the sampled words.

The *Prosodic Level Stress Inventory* and *Prosodic Level CGV Inventory* count the stress and CGV productions (Target→Actual) for each syllable in the sample. The *Prosodic Level Breakdown* table counts the accuracy and errors within stressed and unstressed syllables in 11 dimensions listed below. Captions for the tables will be "Prosodic Level Breakdown" followed by either "(Session)" or "(Participant)" or "(All Participants)".

*Prosodic Level Breakdown* dimensions and definitions:

- **Stress correct** The number of syllables produced with correct stress in each word position.
- **Stress incorrect** The number of syllables produced with incorrect stress in each word position.
- **Full syllable addition** The number of syllables that were added.
- **Full syllable deletion** The number of syllables that were deleted in entirety (nucleus and all onset and/or coda consonants associated with the nucleus).
- **Partial syllable deletion (onset)** The number of syllables in which the onset was deleted but the nucleus of the syllable is realised.
- **Partial syllable deletion (nucleus)** The number of syllables in which the nucleus vowel was deleted (but onset/coda consonants of the syllable were realised)
- **Partial syllable deletion (coda)** The number of syllables in which the coda was deleted but the nucleus of the syllable is realised.
- **Syllable expansion (onset)** The number of syllables in which an onset consonant was added to a syllable.
- **Syllable expansion (coda)** The number of syllables in which a coda consonant was added to a syllable.
- **CGV Shape correct** The number of syllables produced with correct CGV shape (regardless of accuracy).
- **CGV Shape incorrect** The number of syllables produced with incorrect CGV shape (regardless of accuracy).

Example, *Prosodic Level Stress Inventory*

IPA Target	IPA Actual	Count
1	1	29
1	∅	1
2	1	1
2	2	14
U	U	50
U	∅	7

Example, *Prosodic Level CGV Inventory*

IPA Target	IPA Actual	Count
CCV	CV	2
CCVV	CVV	2
CGV	CV	4
CV	CC	1
CV	CVC	1
CV	∅	7
CVC	CV	4

IPA Target	IPA Actual	Count
CVV	GVV	2
GV	V	1
V	V	4
VC	V	1
VC	VC	2

Example, Prosodic Level Breakdown

Dimension	Un'Str Initial	Un'Str Medial	Un'Str Final	Un'Str Total	Str Initial	Str Medial	Str Final	Str Total	Total	%
Stress correct	6	21	23	50	17	19	7	43	93	91.18
Stress incorrect	6	1	0	7	1	1	0	2	9	8.82
Full syllable addition	0	0	0	0	0	0	0	0	0	0.0
Full syllable deletion	6	1	0	7	1	0	0	1	8	7.84
Syllable expansion (O)	0	0	0	0	0	0	0	0	0	0.0
Syllable expansion (C)	1	0	1	2	0	0	0	0	2	1.96
Syllable reduction (O)	3	0	6	0	3	1	4	10	9.8	
Syllable reduction (C)	0	1	1	4	1	1	6	7	6.86	
CGV shape correct	3	15	17	35	13	13	1	27	62	60.78
CGV shape incorrect	9	7	6	22	5	7	6	18	40	39.22

## Segmental Level Inventory and Breakdown Tables

The Segmental Level Inventory and Breakdown table displays segmental level information from the sampled words. The Segmental Level Inventory counts the segmental productions (Target→Actual) in the sample. The Segmental Level Breakdown counts the accuracy and errors within onset, nucleus and coda word positions in six dimensions listed below. Percentage accuracy measures will also be displayed for consonants (onset (PCC-O), coda (PCC-C), and total consonants (PCC)), vowels (PVC) and total phones (PPC). Caption for the table will be “Segmental Level Breakdown” followed by either “(Session)” or “(Participant)” or “(All Participants)”.

*Segmental Level Breakdown* dimensions and definitions:

- **# Target** The number of target phones in each word position (O/N/C) as well as total target consonants and total target phones (total consonants + total vowels)
- **# Correct** The number of phones correct in each word position (O/N/C) as well as total correct consonants and total correct phones (total consonants + total vowels)
- **# Substitutions** The number of phones substituted in each word position (O/N/C) as well as total substituted consonants and total substituted phones (total consonants + total vowels)
- **# Distortions** The number of distorted phones in each word position (O/N/C) as well as total distorted consonants and total distorted phones (total consonants + total vowels)
- **# Epenthesis** The number of added phones in each word position (O/N/C) as well as total added consonants and total added phones (total consonants + total vowels)
- **# Deletions** The number of deleted phones in each word position (O/N/C) as well as total deleted consonants and total deleted phones (total consonants + total vowels)
- **% Correct** The percentage of correct consonants (onset, coda, and total), vowels, and phones.

Example, *Segmental Level Inventory*

IPA Target	IPA Actual	Count
p	p	5
p	b	1
p	f	1
p	∅	2
b	b	6
b	∅	1
t	p	1
t	t	8
t	∅	4
d	d	2
k	s	1
g	g	1
f	f	3
s	∅	2
h	h	2
ðʒ	∅	1
m	m	10
m	n	2
n	n	10
l	l	3
l	∅	6
r	r	1
r	w	3
r	∅	1
j	h	1

IPA Target	IPA Actual	Count
j	j	1
j	∅	2
i	i	3
u	u	2
I	I	8
ɔ	ɔ	3
ɔ:	ɔ:	1
ə	i	1
ə	u	2
ə	ə	37
ə	ʌ	2
ə	æ	1
ə	∅	9
ɛ	ə	1
ɛ	ɛ	8
ʌ	ʌ	2
ɔ	ɔ	2
æ	æ	7
æ	æ:	1
æ	∅	1
a	a	9
v	v	4
∅	t	1
∅	r	1
∅	i	1

Example, *Segmental Level Breakdown*

	Onset	Nucleus	Coda	Total Consonants (O +C)	Total Phones
# Target	93	105	25	118	223
# Correct	57	92	17	74	166
# Substitutions	27	9	1	28	37
# Deletions	9	4	7	16	20
# Distortions	0	0	0	0	0
# Epenthesis	0	1	2	2	3
% Correct	61.29	86.79	62.96	61.67	73.45

## WAP Tables

WAP Tables are produced for each production and contains information supporting the Word, Prosodic and Segmental Level Breakdown tables. Information is printed horizontally in a table with four columns for each table level: (1) Word Level, (2) Prosodic Level, and (3) Segmental Level. Table headings for each will be: (1) Whole Word Measure, Target, Actual, Match (i.e., are Target and Actual identical according to each word level measure. If so, True; if not, False), (2) Prosodic Alignment, Target, Position, and Description, and (3) Segmental Alignment, Target, Position, and Description. Caption for the table will be “Orthography /IPA Target/ ↔ /IPA Actual/”.

### Word Level

*Word Level Breakdown* categories:

- **Word** (whole word accuracy). Did the Actual IPA match the Target IPA?
- **# Syllables** (word length correct). Did the Actual number of syllables match the Target number of syllables?
- **Stress** (lexical stress correct). Did the Actual stress pattern match the Target stress pattern?
- **CGV Shape** (target and actual CV shape with syllable stress, boundaries, and length included). Did the Actual CGV shape match the Target CGV shape?
- **# Transitions** (syllable transitions correct). Did the Actual number of transitions (total number of syllables – 1) match the target number of transitions?
- **Segregated Transitions** No syllable segregations (intra-word pauses in target and actual) should be present in the Target IPA. Does the Actual number of syllable segregations match the target number of transitions (Target = 0)? If false, syllable segregation is present.

Example:

Category	Target	Actual	Match
Word	'bʌtə, flai	'bʌrə, fair	false
# Syllables	3	3	true
Stress	1U2	1U2	true
CGV Shape	'CV.CV,CCVV	'CV.CV,CVV	false
# Transitions	2	2	true
Segregated Transitions	0	0	true

### Prosodic Level

- **Category Stress/CGV Pattern**
- **IPA Target** IPA Target value
- **IPA Actual** IPA Actual value
- **Position** Initial/Medial/Final (syllable position within word)
- **Description**
  - **Correct** The dimension (Target stress or CGV shape) was correct.
  - **Full syllable addition** A full syllable was added.
  - **Full syllable deletion** A full syllable was deleted (including the nucleus and all onset and/or coda consonants associated with the nucleus).
  - **Syllable reduction (onset)** The onset (or at least one consonant of the onset) was deleted but the nucleus of the syllable was realised.
  - **Syllable reduction (nucleus)** The nucleus vowel was deleted (but onset/coda consonants of the syllable were realised).
  - **Syllable reduction (coda)** The coda (or at least one consonant of the coda) was deleted but the nucleus of the syllable was realised.
  - **Syllable expansion (onset)** A consonant was added to the onset of a syllable.
  - **Syllable expansion (coda)** A consonant was added to the coda of a syllable.

Example:

Category	IPA Target	IPA Actual	Position	Description
Stress	1	1	Initial	Correct
	U	U	Medial	Correct
	2	2	Final	Correct
CGV Pattern	CV	CV	Initial	Correct
	CV	CV	Medial	Correct
	CCVV	CVV	Final	Incorrect

### Segmental Level

- **IPA Target** IPA Target value
- **IPA Actual** IPA Actual value
- **Position** Onset/Nucleus/Coda
- **Description**
  - **Correct** The phone was correct (IPA Target matched IPA Actual for target phone).
  - **Substitution** The phone was substituted (IPA Target did not match IPA actual; target phone was substituted for a different phone in IPA Actual).
  - **Distortion** The phone was distorted (IPA Target did not match IPA actual; diacritic/ did not match between IPA Target and IPA Actual).
  - **Epenthesis** The phone was added (IPA Target did not match IPA actual; phone in IPA Actual was added to an empty word position of IPA Target).
  - **Deletion** The phone was deleted (IPA Target did not match IPA actual; phone in IPA Target deleted in IPA Actual creating an empty segment in IPA Actual ).

Example:

IPA Target	IPA Actual	Position	Description
b	b	ONSET	Correct
ʌ	ʌ	NUCLEUS	Correct
t	r	ONSET	Substitution
ə	ə	NUCLEUS	Correct
f	f	ONSET	Correct
l	∅	ONSET	Deletion
a	a	NUCLEUS	Correct
i	i	NUCLEUS	Correct

## Custom Analysis using Composer (simple)

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