MICROPHONE EVALUATION REPORT

Evaluation of the Sennheiser DW Pro1 wireless headset microphone

Background

Sennheiser Communications originally released the DW Office DECT wireless headset microphone for dual use with telephones and PC via an innovative switching system. Later, Sennheiser introduced two new variants, namely the Sennheiser DW Pro 1 and Sennheiser DW Pro2 wireless headset microphones. These are mono and stereo versions of the original DW Office but whereas the original DW Office had a rigid microphone boom, the DW Pro1 and Pro2 have a flexible microphone boom. The tip of the microphone boom can be positioned more closely to the corner of the mouth thereby increasing voice quality whilst talking on the telephone or using the microphone with computer programmes such as speech recognition and VOIP applications such as Skype.

This report evaluates the functionality of this latest version DW Pro1 wireless headset microphone with the Dragon NaturallySpeaking speech recognition software version 11.

Our setup

Firstly, the base station was connected to the telephone using the toggle switch on the base station. The microphone sensitivity at the back of the base station was adjusted up and down whilst speaking to another person on the telephone. It was found that the optimum setting for best volume, clarity and non-echoing on a call was setting 4. (This contrasted with the setting that we used when we tested the original DW Office headset - in that case the optimum setting on the telephone call was setting 6). Call clarity of the DW Pro1 on both sides of the conversation was found to be excellent!

Therefore, we did our DW Pro1 testing with Dragon NaturallySpeaking on microphone sensitivity setting 4 (as opposed to using setting 6 when we tested the original DW Office headset).

Our computer setup was as follows:-

- Speech recognition software - Dragon NaturallySpeaking Professional 11.5
- We tested with a newly- created UK English language model
- Testing was carried out immediately after creating a new speech profile after reading one "easy reading" training text
- The tip of microphone boom was approximately 1 - 2 thumb's gap from the corner of the mouth
- Windows 7 64-bit, 2.2 GHz dual core processor, 4 GB RAM with 8 GB Ready Boost

Word recognition accuracy in Dragon with and without background noise

The procedure was to dictate a dictation text called "The Rainbow Passage" into Microsoft Word 2010. This passage was chosen as it has all the phonemes (word sounds) in the English language.

Average of 3 readings with no background noise - **98.7% accuracy**

The three readings of "The Rainbow Passage" were repeated, this time with loud, simulated office noise in the background. I played a CD called "Thriving Busy Office" on a CD player at maximum volume in the background. The yellow volume bar next to the Dragon microphone icon went into the green showing it was reacting to the background noise. However, on issuing the "play that back" command in Dragon to play back my dictation audio, although the background noise was clearly audible, my speech was predominant over the background noise

Average of 3 readings with background noise – **99.2% accuracy**

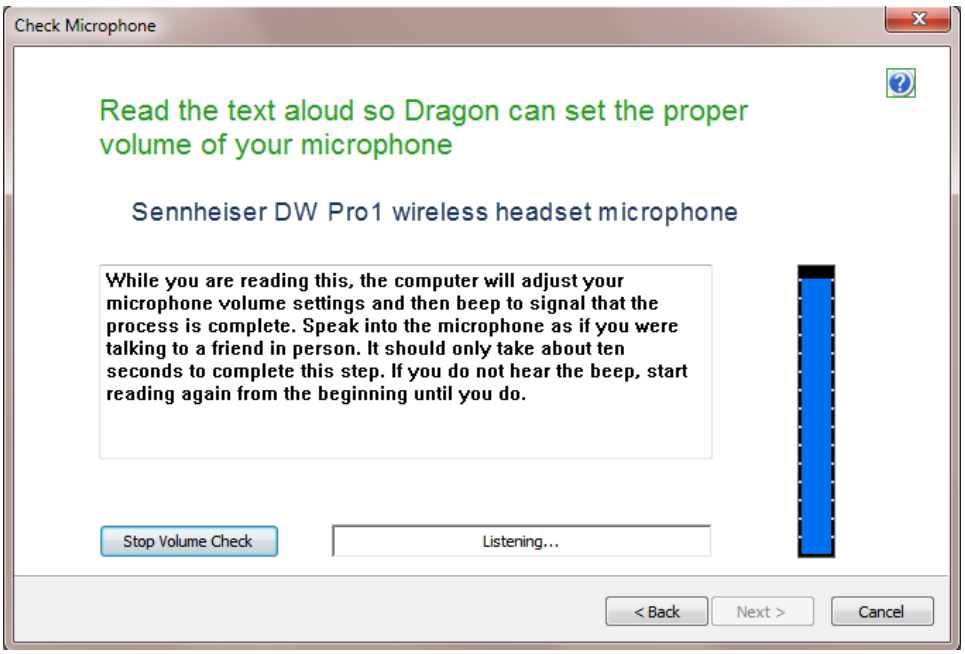
Given the statistical deviation inherent in this type of testing, we feel that the above two results are identical within statistical limits. In this regard, we find the DW Pro1 to deliver excellent accuracy as well as excellent noise cancellation with Dragon NaturallySpeaking speech recognition software.

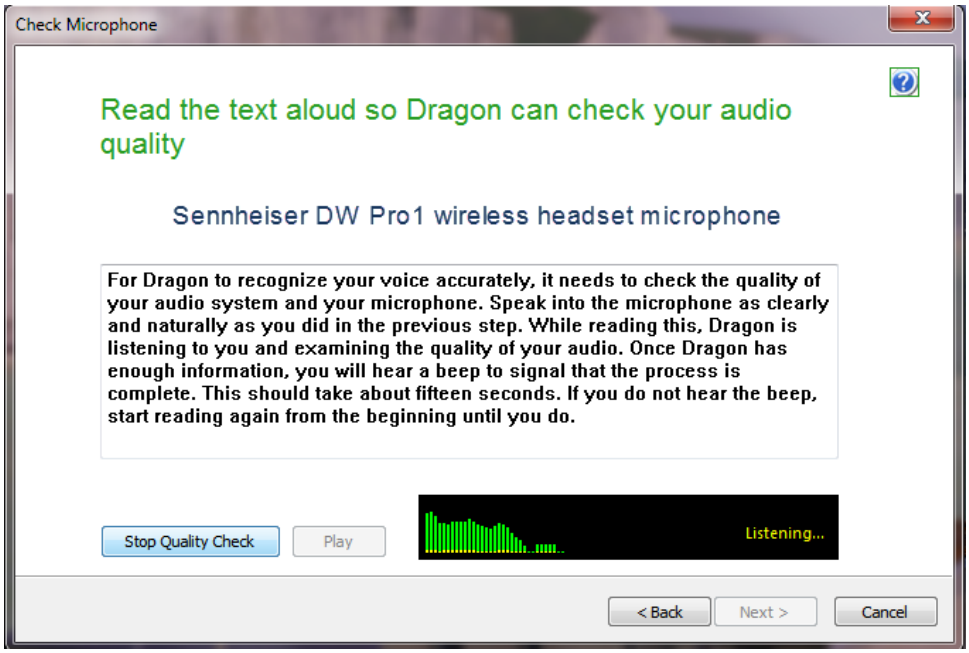
There has been some concern voiced on certain speech recognition forums internationally that the DW Pro1 does not perform that well with Dragon NaturallySpeaking in office environments which have background noise. We must say however that in our testing, we do not find this to be an issue. Note of course that in the summertime, many offices have either fans or air conditioning running and it is possible that windage could be an issue affecting word recognition accuracy. We were unable to test for the effect of wind noise on accuracy in our testing.

For the sake of completeness, in the Appendix, we have summarised all our historical testing on a range of Sennheiser wireless microphones. The historical testing data shows that the Sennheiser DW Pro1 is the highest performing Sennheiser wireless headset tested to date.

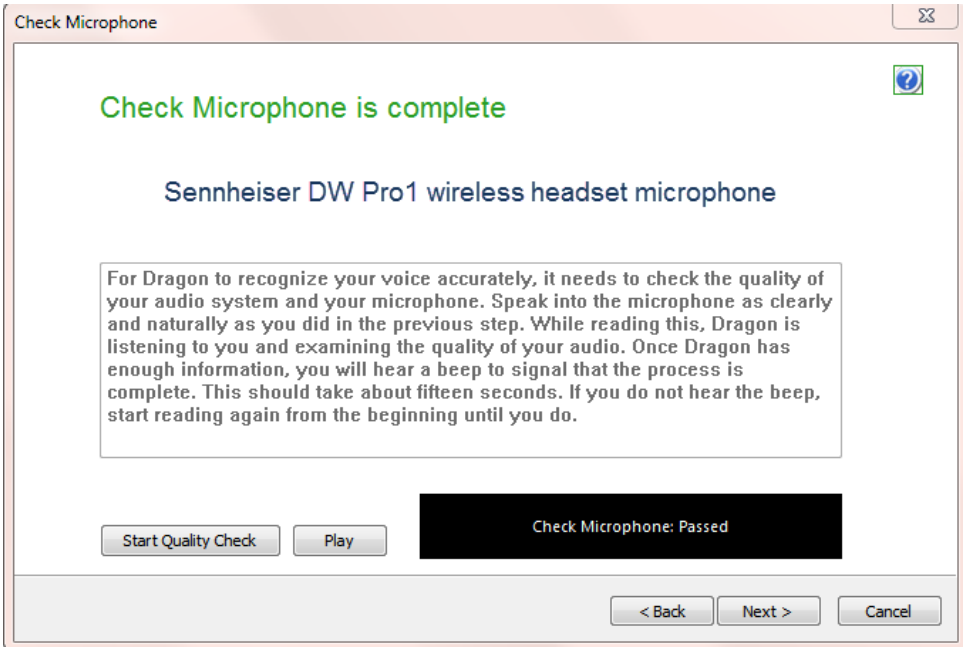
<u>Audio Setup Wizard in Dragon</u>

One can determine a lot about the audio quality of a microphone from running Dragon's audio setup wizard. The following screen shots are self – explanatory.





Note the low noise (yellow) in the speech signal (green) as demonstrated by the extremely flat yellow noise floor.



<u>Our conclusions</u>

1. The DW Pro1 with headband style was found to be very comfortable to wear for long periods of time
2. The author found that speech quality with this microphone is excellent; especially considering it is a wireless microphone! You are unable to tell that you are wearing a wireless headset as playback of your recorded voice from the PC matches that of the best corded headset microphones.
3. Word recognition accuracy in Dragon NaturallySpeaking is excellent when there is no background noise and we found it to be statistically identical in the presence of loud background noise.
4. Speech Empowered Computing can fully endorse the Sennheiser DW Pro1 for speech recognition use in quiet and in noisy environments.

Peter Maddern, Speech Empowered Computing, 7th November, 2011

Appendix

Historical test data

Date tested	Product	Word recognition accuracy (%) No background noise	With background noise
27.10.11	Sennheiser DW Pro1	98.7	99.2
	Sennheiser DW Office	98.4	96.6
03.04.08	Sennheiser VX100 (Vista, Anycom USB-250 USB Adapter, Dragon v 9.5)	93.8	
03.04.08	Sennheiser VX100 (XP Professional, Anycom USB-250 USB Adapter, Dragon v 9.5)	98	96
04.12.08	Sennheiser VMX Office (Vista, Dragon v 10)	98.3	
27.12.07	Sennheiser BW 900 (XP Professional, mic - in jack connection to PC, Dragon 9.5)	98.5