

# Shure WH30XLR cardioid headset microphone and Countryman E6 omnidirectional earset microphone

From Shure and Countryman

Reviewed by Nala Huiying Lee, *University of Hawai‘i at Mānoa*

**1. OVERVIEW.** This review compares two different types of microphones for the purpose of linguistic fieldwork. The two microphones are the Shure WH30XLR cardioid headset microphone and the Countryman E6 omnidirectional earset microphone. These two microphones were used in conjunction with the Zoom H4n recorder on field trips carried out in Singapore and Malaysia in 2013.

**2. NEED FOR UNOBTRUSIVE EXTERNAL MICROPHONES.** Although there are a number of digital audio recorders of reasonable quality easily available in the market nowadays, such as the Zoom H4n, or even the Marantz PMD661 for those with a higher budget, the microphones on these machines can suffer from noise when the unit is being handled. Recording with a Zoom H4n alone may also not be optimal in noisy environments, be it due to constant traffic in an urban landscape, or rain falling on a zinc roof in a more rural setting. In addition, it is difficult to request that language consultants maintain a set distance away from the stationary recorder, and both situations are not ideal. When consultants move away from the recorders, their voices may become too soft. In the case of the overzealous consultant, the researcher may be dismayed to find her or his recording to be full of popping sounds caused by producing plosives too closely to the microphone. Consequently, it is generally a good idea to incorporate the appropriate external microphones into linguistic fieldwork, and the more discreet and forgettable these microphones, the better.

The following two spectrograms compare a recording made solely by the internal microphones of the Zoom H4n (Figure 1), and a recording made by pairing the Countryman E6 omnidirectional earset microphone with the Zoom H4n (Figure 2). Made on the same occasion, these clips were recorded indoors on a rainy day at a location with zinc roofing. On the spectrogram in Figure 1, the red areas of intensity or loudness do not necessarily correspond to speech sounds. Yellow represents the areas of highest intensity. These areas do not all correspond to speech sounds in Figure 1 (at the beginning of the spectrogram) while they do so in Figure 2. These areas of intensity are less distinct on Figure 1 than on Figure 2, and the sound clip accompanying Figure 1 is also considerably noisier than the sound clip accompanying Figure 2. These recordings demonstrate how it is more optimal to use a good quality external microphone, rather than the in-built microphones on the recorder, especially in noisy environments.

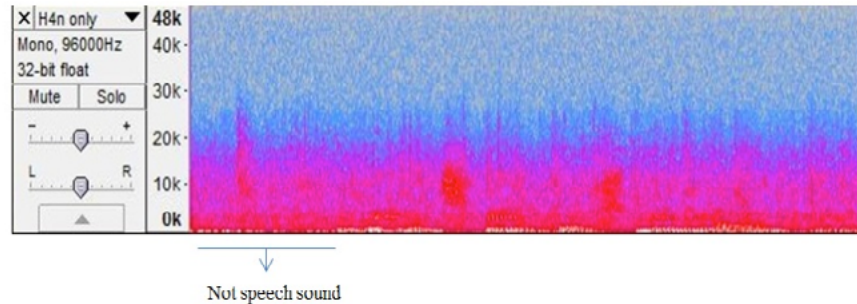


FIGURE 1. Spectrogram<sup>1</sup> of “The rain in Spain falls mainly on the plain” using only the H4n on a rainy day. 🗣️

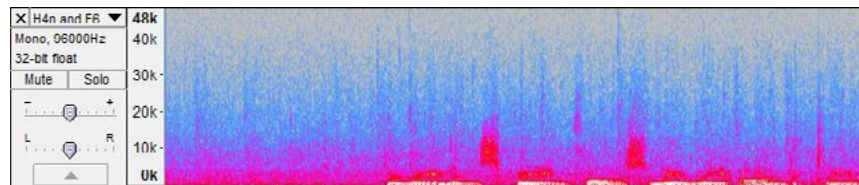


FIGURE 2. Spectrogram of “The rain in Spain falls mainly on the plain” using the H4n in conjunction with the E6 on a rainy day. 🗣️

**3. CONNECTOR TYPE.** While the Shure WH30XLR comes with a standard XLR connector, different versions of the Countryman E6 come with different types of connectors. The version of the Countryman E6 being reviewed here utilizes the XLR connector. I prefer XLR connectors over the TRS (tip, ring, sleeve) connectors, more commonly known as jack plugs or phone plugs. TRS connectors are of higher impedance, whereas XLR connectors are of low impedance. Using XLR connectors thus reduces noise caused by high impedance, especially when using long cables in particular. For the purpose of capturing good quality data for language documentation, it is ideal to use microphones with XLR connectors. It is important to note that the audio recorders used with these microphones have to be XLR-compatible. The Zoom H2 and the Zoom H2n can only be used with microphones that utilize TRS connectors, and cannot be used in conjunction with both the Shure WH30XLR and the XLR version of the Countryman E6. Recorders that can accept XLR connections include the Zoom H4n and the Marantz PMD661. Both recorders mentioned can take up to two XLR inputs each.

**4. CONDENSER MICROPHONES.** Both the SHURE WH30XLR and the Countryman E6 are condenser microphones. Condenser microphones are also known as capacitor microphones, capacitors being an electronic component that stores energy in the form of an

<sup>1</sup> These spectrograms are made using Audacity, a free, open source, cross-platform software for editing and recording sounds. The version used is 2.0.4.

electrostatic field. This electrostatic field is created between two plates that have a voltage between them. The outside plate acts as a diaphragm that vibrates when sound waves come into contact with it. This changes the distance and hence, capacitance, between the two plates. The closer the plates are together, the higher the capacitance, and a high capacitance results in a charge current. The further the plates are from each other, the lower the capacitance, and low capacitance results in a discharge current. The audio signal is derived in this manner. For the condenser microphone to work, a voltage has to run across the two plates. This voltage can be derived from a battery within the microphone or through phantom powering<sup>2</sup>, where external power is provided through the audio cables. The Shure WH30XLR and the Countryman E6 XLR both utilize phantom power that is conveniently provided by the recorder that they are connected to.

Condenser microphones are preferable over dynamic microphones<sup>3</sup> for capturing very detailed speech sounds. This can be attributed to their thinner diaphragms (as compared to the dynamic microphone). In addition to being more sensitive, these thinner diaphragms also mean that they are able to pick up higher frequency sounds. However, the thinner diaphragms on condenser microphones are also less sturdy. These are prone to distortion when encountering very loud noises, and in general, condenser microphones are more fragile and may break easily when dropped. The prospect of distorting the diaphragm on a condenser microphone should not concern a linguist too much unless in the unlikely event that she or he is interested in recording speech sounds at a rock concert. However, the Shure WH30XLR and the Countryman E6 should still be handled with due caution, both being condenser microphones that should not be dropped or hit in any way. Protective cases should be utilized when transporting these microphones, and consultants should be asked to not touch the microphone component itself, but to handle the microphone by its other parts.

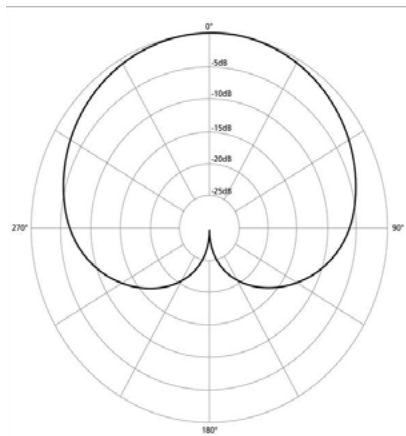
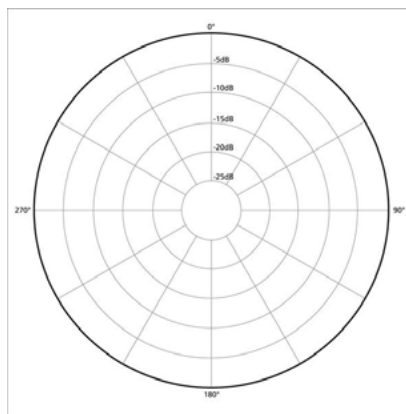
**5. CARDIOID VERSUS OMNIDIRECTIONAL.** Both condenser microphones reviewed differ significantly with regard to their polar patterns, or the directions that individual microphones are sensitive to. While the Shure WH30XLR is a cardioid microphone, the Countryman E6 under review is an omnidirectional microphone. The Shure WH30XLR, being a cardioid microphone, picks up sound mostly from the front. (See Figure 3).

This makes it particularly suitable for capturing speech from a single speaker. Although it does receive some sound from its sides due to its cardioid pattern, the Shure WH30XLR captures less ambient sound than the Countryman E6 omnidirectional microphone. The Countryman E6 omnidirectional microphone is good for capturing sound from every direction (See Figure 4).

---

<sup>2</sup> Phantom powering is a means of using DC electric power to power microphones that require an external source. It is a convenient method as it transmits power through the XLR cable whose other duty is to transmit audio signals.

<sup>3</sup> The dynamic microphone has a diaphragm that vibrates when sound pressure waves come into contact with it. The diaphragm is attached to a coil, and these vibrations move this coil of wire back and forth along a magnet that the coil is wrapped around. This in turn generates an electrical alternating current that is sent down the wires to the device that it is connected to.

FIGURE 3. Example of a cardioid polar pattern.<sup>4</sup>FIGURE 4. Example of an omnidirectional polar pattern.<sup>5</sup>

This orientation makes the Countryman E6 less suitable for the purpose of language documentation in considerably noisier environments, since ambient noise may easily overwhelm speech.

The spectrograms and sound clips below compare the two microphones' performances in the same environment. Again, these recordings were made indoors on a rainy day at a

---

<sup>4</sup> Image from Wikimedia (creative commons license, author: Galak76, [http://commons.wikimedia.org/wiki/File:Polar\\_pattern\\_cardioid.png](http://commons.wikimedia.org/wiki/File:Polar_pattern_cardioid.png))

<sup>5</sup> Image from Wikimedia (creative commons license, author: Galak76, [http://commons.wikimedia.org/wiki/File:Polar\\_pattern\\_omnidirectional.png](http://commons.wikimedia.org/wiki/File:Polar_pattern_omnidirectional.png))

location with zinc roofing. Figure 5 shows the spectrogram of the clip that was recorded using the Countryman E6 and the Zoom H4n. Figure 6 shows the spectrogram of the clip that was recorded using the Shure WH30XLR and the Zoom H4n. (Figure 2 is replicated here as Figure 5.)

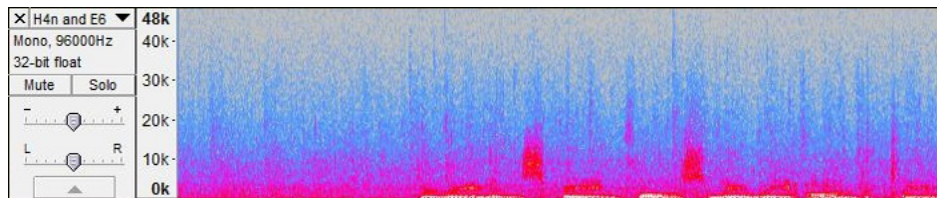


FIGURE 5. Spectrogram of “The rain in Spain falls mainly on the plain” using the H4n in conjunction with the E6 on a rainy day. 🗣️

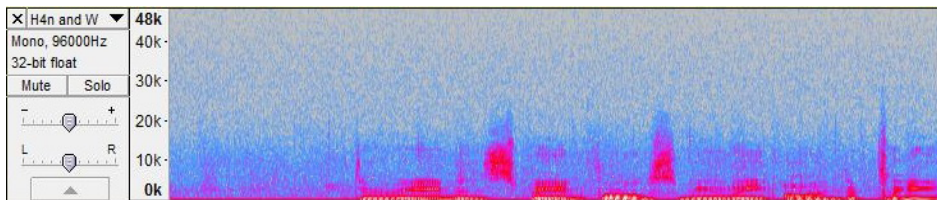


FIGURE 6. Spectrogram of “The rain in Spain falls mainly on the plain” using the H4n in conjunction with the WH30XLR on a rainy day. 🗣️

Using the same volume setting on the H4n, the sound clip that was recorded using the Shure WH30XLR, is quieter than the sound clip that was recorded using the Countryman E6. Their respective spectrograms also show this difference. However, note that the yellow areas of intensity that correspond to speech sound in both spectrograms, are more distinct in Figure 5 than in Figure 6. While the Shure WH30XLR eliminates more noise, it has a more muted response than the Countryman E6. Likewise, the speech sounds in the sound clip that was recorded using the Countryman E6 are richer than the ones in the the sound clip that was recorded using the Shure WH30XLR).

The spectrograms and sound clips show that being more directional, the Shure WH30XLR is more capable of eliminating ambient noise than the Countryman E6 omnidirectional microphone. The Countryman E6, however, appears to capture richer details than the Shure WH30XLR, and this may be useful to linguists interested in minute details, such as phoneticians.

**6. PHYSICAL CHARACTERISTICS.** The Shure WH30XLR is a headset microphone that is kept in place with a wire frame worn over the ears (Figure 7). The wire frame and elastic headband that stretch behind the head when worn are said to be compatible with any head size. A bendable boom extends from behind the right ear, and can be collapsed so that the headset fits into a black storage bag the size of a gallon slider plastic bag. At the end of the boom is the electric condenser mic, protected by a snap-on windscreen.



FIGURE 7. Image of Shure WH30XLR cardioid headset microphone.

An extra windscreen is provided in the box. There is only a black option for the Shure WH30XLR, which looks and feels noticeably heavier than the Countryman E6 (Figure 8). While the Shure WH30XLR is a headset microphone, the Countryman E6 is an earset microphone. The Countryman E6 setup comprises a single thin hook to be worn around either ear, and a short, adjustable, and equally slim boom that extends from this hook. The microphone comes with a windscreen, and directional caps that are meant to both protect the mic and aid the shape of its directional pattern.



FIGURE 8. Image of Countryman E5 omnidirectional earset microphone.

The Countryman E6 comes in a range of colors that supposedly blends with a wide range of skin tones. As mentioned previously, it is more inconspicuous and lighter than the Shure WH30XLR. While the Shure WH30XLR comes with a soft storage bag that provides little protection to the mic, Countryman provides a more durable hard exterior carrying case that is about 9 by 5 in. (23 by 13cm). This carrying case sufficiently protects

the microphone from knocks and general manhandling.

Both the Shure WH30XLR and the reviewed version of the Countryman E6 utilize XLR connectors. The cable provided with the Shure WH30XLR is 4 ft. (1.22 m) long, while the cable provided with the Countryman E6 is 5 ft. (1.52 m) long.

**6. EASE OF USE.** Both microphones are easy to wear, although the Shure WH30XLR might require slightly more adjusting because of its extended boom. The boom is to be adjusted so that the microphone is at the side of the speaker's mouth, not directly in front, since wearing the mic directly at the mouth causes plosive pops. Because the boom is long, the Shure WH30XLR fits better on speakers with larger faces. I discovered that for smaller faces, the boom should be adjusted so that the microphone is below the speaker's mouth. Less adjustment is required with the Countryman E6. Speakers may also prefer the Countryman E6 over the Shure WH30XLR, because the hook on the Countryman E6 slides over the wearer's ear easily, while it takes some fiddling to adjust the Shure WH30XLR's wireframe across the back of the head and hook it on both ears. The Countryman E6 is also lighter and much more comfortable to wear than the Shure WH30XLR, whose wireframe could be tight for speakers with bigger heads. Aside from physical comfort, speakers may be more natural and relaxed using the Countryman E6 as its small frame makes it easily forgettable. The Shure WH30XLR on the other hand, being heavier, bigger, and tighter around the head, might make the speaker more aware that she or he is being recorded. Thus far, all of my consultants who have used both microphones prefer the Countryman E6, predictably so, for its comfort. In terms of fit, the only drawback of the Countryman E6 is that, being looser, it has the tendency to move or fall off if one is not careful. The Shure WH30XLR has a tighter fit, and stays more securely on the speaker.

Both sets of equipment come with windscreens that can be snapped on to protect the microphone components. The windscreen for the Shure WH30XLR is more secure when snapped on, as compared to the Countryman E6's windscreen. I have developed a tendency to check if the windscreen of the Countryman E6 is still on the microphone at the end of each recording session, because it has fallen off so often. Unfortunately, there is no extra windscreen provided with the Countryman E6. Conversely, an extra windscreen is provided with the Shure WH30XLR microphone set, even though the windscreen snaps on tightly each time and is in little danger of being lost.

In general, both microphones are well-made and sturdy, although care should still be taken to not damage the actual microphone components on these sets. The collapsible boom on the Shure WH30XLR snaps into and out of position easily, yet without threatening to break or become loose, and the XLR connectors on both microphones are solid and fit the H4n recorder snugly.

**7. VERDICT.** Both the Shure WH30XLR cardioid microphone and the Countryman E6 omnidirectional microphone are essential pieces of equipment in my language documentation project. The Countryman E6 is considerably more expensive than the Shure WH30XLR<sup>6</sup>,

---

<sup>6</sup> I purchased the Shure WH30XLR headset microphone for USD152, and the Countryman E6 omnidirectional earset microphone for USD350.

but is extremely comfortable to wear, inconspicuous, and provides good, detailed sound quality. This is good particularly for field linguists who are interested in acoustic phonetics. The Shure WH30XLR on the other hand, is good value for less money, and especially ideal for recording in noisy environments. For general language documentation, I personally tend to use the Shure WH30XLR for myself and the Countryman E6 omnidirectional for my consultant if I am carrying out a one-to-one interview in a reasonably quiet environment. In noisy environments, I prefer to let my consultants use the Shure WH30XLR. While the sound quality captured is not as rich as the Countryman E6, the Shure WH30XLR is adequate for general language documentation.

The pros and cons of both microphones are summed up in the following table:

Shure WH30XLR cardioid headset mic	Countryman E6 omnidirectional earset mic
COMPARISON OF FUNCTIONALITY:	
Value for money	Expensive
Reasonable sound quality	Very detailed sound quality
Great for eliminating ambient noise	Okay for eliminating ambient noise
Harder to wear	Easy to wear
Comfortable to wear	Less comfortable to wear
Conspicuous	Inconspicuous
Great for general language documentation	Great for acoustic phonetic work
SPECS:	
Transducer: Electret Condenser	Transducer: Condenser
Cardioid polar pattern	Omnidirectional polar pattern
Frequency response: 40Hz to 20kHz	Frequency response: 30Hz to 15kHz
Typical dynamic range: 111dB	Typical dynamic range: not available
Signal to noise ratio: 63dB @ 94dB SPL (ref. A-weighted noise)	Signal to noise ratio: 29dBA SPL
Maximum input level: 142dB	Maximum input level: 130dB SPL
Power requirements: 11V to 52V phantom power	Power requirements: +48V phantom power
Output impedance: 150 ohms at 1kHz	Output impedance: 2k ohms
Output connectors: 3-pin XLR male	Output connectors: XLR
Cable length: 5ft (1.52m)	Cable length: 4ft (1.22m)
Weight of headset and cord: 2.1oz (60g)	Weight: 0.07oz (2g)
Weight of preamplifier: 3.5oz (99g)	

TABLE 1. General comparison of the Shure WH30XLR cardioid microphone and the Countryman E6 omnidirectional microphone.

Nala Huiying Lee  
leehn@hawaii.edu