NEWSLETTER
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Choosing measurement system - wired vs. wireless

Wireless physiological measurement systems have become more common and reached the point where the cost is about the same as for a traditional wired measurement system. If the price is not decisive, you may ask the question: When to choose one over the other?

Freedom of movement
Perhaps the most obvious is that a wireless system increases physical freedom of movement. The subject can move in the lab without being restricted by cables. This makes wireless systems ideal for exercise physiology and sports.

Psychological reaction on the measurement
One can not ignore the bias that consists of responding to the actual situation of the lab, being monitored and "connected" to a measurement system. In clinical contexts, the well-known phenomenon of white coat hypertension, which is one of the reasons for being able to measure blood pressure at home instead. Similar phenomenons can be amplified by the amount of cables and the limited freedom of movement resulting from the use of cables. Here, a wireless system can make the whole situation a bit more relaxed and natural for the subject as well.

Functionality and technical data
Basically, the same measurement quality is available on both measurement systems for all practical purposes. However, some advantages of BIOPAC's wired amplifier compared to the wireless BioNomadix system is that the wired system has 16 bit A/D while the wireless BioNomadix system has 12 bits. In most cases, it does not matter, unless you study skin conductance responses and specifically work with extremely low thresholds (less than 0.01uS) for SCR detection, then it is for example an advantage of the wired EDA100 compared to the wireless BN-PPGED. Some other differences are that low and high-pass filter settings are sometimes more advanced on the wired amplifiers and these settings are available on the front of the amplifiers. The BioNomadix modules are delivered with the default settings for the filters that work for most, but allow them to be changed if necessary, and via hidden dipswitches on the receiver side.

Noise and signal quality in theory and practice
The cables from electrode to amplifier in practice constitutes an antenna that picks up interference that is then superimposed on the signal. So, even though the wired amplifiers sometimes have some better features in theory, it's the shorter cables of wireless systems which generally gives you better signal to noise ratio. This is sometimes seen in the case of weak noise sensitive signals such as facial EMG.

Synchronisation and realtime performance
The wireless link in BioNomadix introduces an additional real-time delay of 15.6 ms in relation to wired signals. Since the variability is low (+/- 0.5ms), this is in practice no problem because it is easy to correct a fixed delay.

Release your experiment from the lab environment
If you also want to reduce the bias that results from being in a lab environment, you can combine the wireless BioNomadix modules with a logger. This allows you to measure outside of the lab, or have freedom of movement that is not limited by the wireless range of about 10m.

Conclusion: Wired or wireless?
Today, the wireless system is usually the first choice and what we recommend for new research systems, unless there is a specific technical reason for preferring a wired system. The overall benefits the wireless system has is by making the measurement situation a bit more natural for the subject as well as reducing cable lenght. Remember, it is also great to combine wired systems with wireless parameters, with the aim of reducing the amount of cables between the subject and the measurement system, if it's not possible to completely eliminate the cables.

If you have any thoughts on this for your research, please contact our application expert Fredrik Rådebjörk, **fredrik@jor.se**

Find our wireless systems here:
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