

New Products

Respiration Belt MR

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Over the past decades, the measurement of respiratory parameters has grown in importance in many fields of psychophysiological research. The main reason is that physiological changes in respiratory behavior could be linked to many different psychological processes and conditions such as emotions and affect, mental load and stress, subjective distress and psychosomatic disorders.

All these issues can be addressed by means of respiration measures alone or in combination with other research methods as EEG or fMRI. The advantages of combined measurements with EEG and fMRI are well known: in addition to the information supplied by the peripheral signal, an EEG reveals the electrical activity of the cortex with the maximum time resolution, whereas fMRI provides information about the localization of both cortical and subcortical BOLD (blood-oxygen level dependent) activity with remarkable spatial resolution.

Not only that, respiratory parameters have revealed themselves to be very useful, even from an entirely different perspective. Respiration introduces noise into fMRI data in different ways (Chang & Glover, 2009; Giardino et al., 2007). Thoracic or abdominal movements during respiration cause movement of the whole body and may lead to image distortion. Moreover, changes in the subjects' breathing rate and depth may affect BOLD signal fluctuations due to the modulation of cerebral blood flow. Because there are different approaches to control-

ling these artifacts, it is useful, and perhaps even necessary, to co-acquire respiratory activity during fMRI.

There are different ways to enable measurement of respiratory activity. We have chosen to develop a respiration belt, as this is a comfortable, non-intrusive sensor. Use of the Respiration Belt MR is not perceived as disturbing by the test subjects, who may already be negatively affected by the fMRI procedure (see also Cook et al., 2007). Unfortunately, the use of electrical devices – such as the Respiration Belt MR – in strong magnetic and HF fields is hazardous and requires particularly careful design. On the basis of our many years of familiarity with combined EEG and fMRI measurements as well as on our growing experience in the field of peripheral signals, we have come up with the Respiration Belt MR, a product that combines high data quality with safe recording.

This has been made possible thanks to special solutions implemented in the sensor as well as to the configuration of the entire system. For example, noise can only be induced in the wire connecting the sensor with the amplifier and this wire is kept as short as possible: unlike most solutions available on the market, our amplifiers can be situated in the scanner room close to the scanner without producing any artifacts in the MR images and without causing any damage to the EEG equipment. Moreover, the amplifier's high CMRR characteristics further suppress noise. ●

References

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