

**Fig. S1** Comparison of magnitude-squared coherence of HbR signals across four contrasting conditions. Coherence plots for intra-subject homologous, intra-subject control, inter-subject random and white gaussian noise (baseline) conditions without (left) and with short channel correction (right). Dashed vertical grey lines indicate resting state frequency band (0.009-0.1 Hz). Mayer wave frequency band (0.05-0.15 Hz), respiratory band (0.2-0.3 Hz) and heartbeat band (~1 Hz) are highlighted in shaded grey boxes with increasing color intensity.

## A **HbO without Correction** HbO with Short Distance (SD) Filter 1 Magnitude-Squared Coherence Homologous Homologous Control Control 0.8 0.8 0.6 0.6 0.4 0.4 0.2 0.2 0 0 0.1 0.01 0.1 0.01 1 Frequency (Hz) Frequency (Hz) В HbR with Short Distance (SD) Filter **HbR without Correction** 1 Magnitude-Squared Coherence Homologous Homologous Control Control 0.8 0.8 0.6 0.6 0.4 0.4 0.2 0.2 0 0 0.01 0.1 0.001 0.01 0.1 1 Frequency (Hz) Frequency (Hz) С HbO HbR Without Correction Without Correction Magnitude-Squared Coherence \* p<0.001 \* p<0.001 With SD Filter With SD Filter Error Bars: 95% CI 0.8 0.8 0.6 0.6 0.4 0.4 0.2 0.2 0 0 Homologous Control Homologous Control

## **First 10 Minutes**

**Fig. S2** Participant-averaged magnitude-squared coherence results for two connectivity groups with and without short channel correction considering the data of only 'first' 10 minutes of the recording. (A) Comparison of coherence of HbO signals without (left) and with short channel correction (right). (B) Comparison of coherence of HbR signals without (left) and with short channel correction (right). (C) Bar chart represents mean coherence of frequency band 0.05-0.1 Hz for both connectivity groups with and without short channel correction for HbO (left) and HbR (right). Error bars represent 95% confidence intervals across subjects.

**Connectivity Group** 

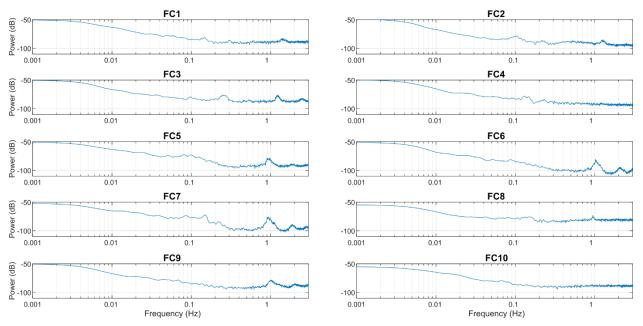
**Connectivity Group** 

## А **HbO without Correction** HbO with Short Distance (SD) Filter 1 Magnitude-Squared Coherence Homologous Homologous Control Control 0.8 0.8 0.6 0.6 0.4 0.4 0.2 0.2 0 0 0.1 0.01 0.1 0.01 1 Frequency (Hz) Frequency (Hz) В HbR with Short Distance (SD) Filter **HbR without Correction** 1 Magnitude-Squared Coherence Homologous Homologous Control Control 0.8 0.8 0.6 0.6 0.4 0.4 0.2 0.2 0 0 0.001 0.01 0.1 0.01 0.1 1 Frequency (Hz) Frequency (Hz) С HbR HbO Without Correction Without Correction Magnitude-Squared Coherence \* p<0.001 \* p<0.001 With SD Filter With SD Filter Error Bars: 95% CI 0.8 0.8 0.6 0.6 0.4 0.4 0.2 0.2 0 0 Homologous Control Homologous Control **Connectivity Group**

## Last 10 Minutes

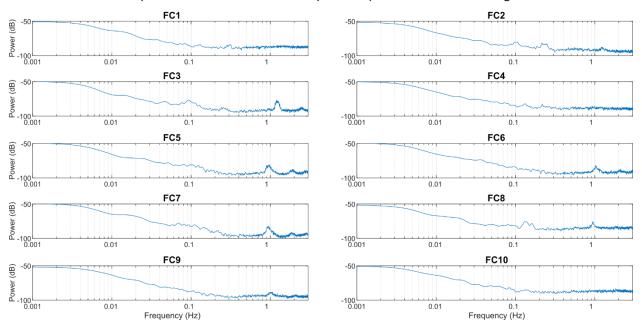
Fig. S3 Participant-averaged magnitude-squared coherence results for two connectivity groups with and without short channel correction considering the data of only 'last' 10 minutes of the recording. (A) Comparison of coherence of HbO signals without (left) and with short channel correction (right). (B) Comparison of coherence of HbR signals without (left) and with short channel correction (right). (C) Bar chart represents mean coherence of frequency band 0.05-0.1 Hz for both connectivity groups with and without short channel correction for HbO (left) and HbR (right). Error bars represent 95% confidence intervals across subjects.

**Connectivity Group** 



Mean Power Spectrums of Removed Principal Components - HbO: Averaged Over All PCs

**Fig. S4** Mean power spectrums of removed principal components (all PCs) of HbO signals of short channels for each participant. FC# denotes the participant ID.



Mean Power Spectrums of Removed Principal Components - HbR: Averaged Over All PCs

**Fig. S5** Mean power spectrums of removed principal components (all PCs) of HbR signals of short channels for each participant. FC# denotes the participant ID.

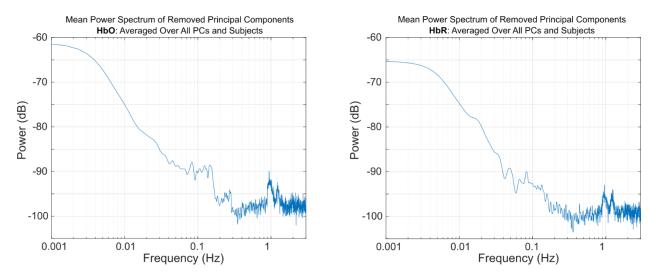


Fig. S6 Mean power spectrums of removed principal components (all PCs) of HbO (left) and HbR (right) signals of short channels averaged across all participants.