

Abstract Submitted
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Transitions in Physiologic Coupling: Sleep Stage and Age Dependence of Cardio-respiratory Phase Synchronization¹ RONNY P. BARTSCH, PLAMEN CH. IVANOV, Harvard Medical School and Division of Sleep Medicine, Brigham and Womens Hospital, Boston, MA 02115, USA — Recent studies have focused on various features of cardiac and respiratory dynamics with the aim to better understand key aspects of the underlying neural control of these systems. We investigate how sleep influences cardio-respiratory coupling, and how the degree of this coupling changes with transitions across sleep stages in healthy young and elderly subjects. We analyze full night polysomnographic recordings of 189 healthy subjects (age range: 20 to 90 years). To probe cardio-respiratory coupling, we apply a novel phase synchronization analysis method to quantify the adjustment of rhythms between heartbeat and breathing signals. We investigate how cardio-respiratory synchronization changes with sleep-stage transitions and under healthy aging. We find a statistically significant difference in the degree of cardio-respiratory synchronization during different sleep stages for both young and elderly subjects and a significant decline of synchronization with age. This is a first evidence of how sleep regulation and aging influence a key nonlinear mechanism of physiologic coupling as quantified by the degree of phase synchronization between the cardiac and respiratory systems, which is of importance to develop adequate modeling approaches.

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