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THE FOUR SEASON BRAIN - CIRCANNUAL CHANGES IN NEUROBIOLOGY

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Objective: Climate, in particular sunshine, is known to influence mood and energy levels, leading to a positive upswing on bright, sunny days and negative downswing in the cold, dark winter seasons.

Increased serotonin transporter availability in healthy human subjects has been revealed in times of lesser light exposure and lower serotonin levels have been examined in the winter season.

Methods: 36 drug naive healthy human subjects underwent this retrospective study, investigating light-dependent alteration of serotonin-1A (5-HT_{1A}) receptor binding in the human brain. 5-HT_{1A} receptor binding was quantified using positron emission tomography and the selective radioligand [carbonyl-¹¹C]WAY-100635.

In a next step, 5-HT_{1A} binding potentials were correlated with the amount of individual exposure to global radiation and sunshine.

Results: A significant positive correlation between the regional postsynaptic serotonin-1A receptor binding and global radiation accumulated over a period of 5 days was found. Furthermore, significant differences between subjects of low and high exposure to global radiation were revealed, whereas subjects who were exposed to a lower amount of global radiation showed 20-30% lower serotonin-1A receptor binding.

Conclusions: Our results showed a significant positive relationship between the accumulated amount of global radiation (5 days) and the serotonin-1A receptor binding in several limbic regions. Together with recently demonstrated seasonal fluctuations in serotonin turnover and transporter availability, our results underline the influence of seasonal factors in the regulation of brain serotonin transmission and might help to elucidate the pathogenesis of seasonal affective disorders.