

depressed, the lower (more evening-typed) M-E scores were ( $p < 0.001$ ). Tryptophan ingested at breakfast is very important for children to keep to a morning-type diurnal rhythm and high quality of sleep, presumably, through metabolisms of tryptophan to serotonin in the morning and from serotonin to melatonin at night. There is some potential of indirect linkage of permanent lack of tryptophan uptake to the induction of low level of mental health via the shifting of evening-typology.

#### **PB2-4 Influence of Acquired Color Deficiency owing to Aging on Human Sleep**

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It has been reported that elderly people have various troubles in the biological rhythms. In general, elderly people retire and get up earlier compared with young people. However, their sleep is fractionated and daytime naps increase in frequency. There are qualitative changes in nocturnal sleep also. Thus, decreases in slow wave sleep (SWS) and sleep efficiency, and increases of the frequency of waking episodes during sleep have been reported. However, there are few reports concerning associations between physical activities and receiving light during the daily routine, color deficiency and sleep quality. This study investigated these relationships by the using light and activity monitor (Actiwatch-L) and the desaturated 15-hue color test. Twenty-four healthy elderly participants took part in the experiment and were classified into Normal, Low, and High levels concerning acquired color deficiency. Physical activity and the quantities of light received by the participants during the daytime and nighttime were not significantly different among three groups. ANOVA disclosed that "Actual Wake rate (%)" was significantly different ( $p = 0.0221$ ). Post-hoc test showed that it was significantly different between Normal and High ( $p < 0.05$ ). These results suggest convincingly that the decrease of optical ability owing to aging might be of significance for the determination of the quality of sleep.

#### **PB2-5 Effect of Ultra-Violet Light Exposure on Some Immunological Parameters in Humans**

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This study assesses the effects of UV+ or UV- conditions, under the sun light environment, on selected immunological parameters with 14 healthy young men (aged  $21.9 \pm 1.6$ yr). Subjects were divided into UV+ group without and UV- group with clothing. They stayed outside between 11:00 h to 14:00 h. Just before the start/end of UV light exposure, blood sample was taken for later immunological assay of WBC, phagocytosis, IL-6, IL-10, CD4<sup>+</sup>CD25<sup>+</sup> T cells, and NK-cells. The results were as follows: 1) WBC and Phagocytosis did not vary between both groups; 2) CD4<sup>+</sup>CD25<sup>+</sup> T cells tended to decrease under UV- group; 3) NK cells were significantly lower under UV+ compared to UV- exposure; 4) IL-6 were significantly higher under UV+ conditions; 5) Sympathetic nervous system was activated during exposure to UV. These findings are discussed in terms of immune and autonomic nervous system under the influence of UV light exposure.

#### **PB2-6 Influence of 3 hr Natural Solar UV Exposure on Core and Skin Temperatures and Fatigue Sensation**

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This study was conducted, on 20<sup>th</sup> September in 2005, to examine how the exposure to natural solar radiation including UV could influence the core and skin temperatures, and fatigue sensation. Fourteen male (aged 20-22 years) participants with skin type II (Sato, 1992) were randomly divided into two groups. In one group 7 participants wore 100% cotton long-sleeved clothing and full-lengthened trousers (A), and 7 other ones wore the same clothing with uncovered area over their back (B). They were sitting in a chair against sun (11:00-14:00) in a top of the building (North 34°, East 135°, Kyoto, mean air