Effectiveness of a PHR-Based Intervention for Diabetes Prevention: A Randomized Controlled Trial

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Background : Personal Health Records (PHRs) integrate health checkups, medical, and lifestyle data, and are expected to support health promotion and disease prevention. However, evidence on linking PHR use with lifestyle modification and behavioral change remains limited. This study evaluated the effectiveness of a PHR-based intervention for diabetes prevention.

Methods : A randomized controlled trial was conducted from March 2024 to March 2025 among residents aged ≥40 years in Kyoto City and surrounding areas with HbA1c ≥5.6%. Participants were randomized with stratification by sex and residential area. All participants collected PHR data via a smartphone application, a wrist-worn activity tracker, and continuous glucose monitoring. The intervention group additionally received monthly lifestyle counseling by health promoters, based on PHR data visualized on a web dashboard. The primary outcome was the change in average daily steps at 3 months. Secondary outcomes included glycemic control, blood pressure, BMI, and related measures. Between-group differences in changes over time were analyzed using ANCOVA.

Results : Ninety-six participants (49 intervention, 47 control; mean age 63.1 years; 31.3% rural) were analyzed. The between-group difference in the change in average daily steps (intervention - control) was 1,195 steps (95% CI: 153.5 to 2237.2, p=0.025). For glycemic control, the between-group differences in the change of in “time in range” and “glucose management indicator” were 1.6% (95% CI: –6.50 to 3.29) and –0.01% (95% CI: –0.24 to 0.21).

Conclusion : The PHR-based intervention significantly increased physical activity among residents with elevated HbA1c. Visualization of PHR data combined with regular support from health promoters may help facilitate lifestyle modification. Broader implementation will require collaboration with municipalities and other stakeholders.

Association between Muscle Quality and Multifaceted Sleep Disturbances: A Cross-sectional Study

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Background : Muscle quality index (MQI), defined as muscle strength per muscle mass, is gaining attention as an indicator of physical functional status. Previous studies have shown that MQI is associated with trouble sleeping, reliance on single sleep item limits interpretation. To date, no studies have examined this in Japanese populations. We examined the association between MQI and Pittsburgh Sleep Quality Index (PSQI), a comprehensive measure of sleep disturbances, in Japanese adults.

Methods : This cross-sectional study included adults under age 60 from the Iwaki Health Promotion Project 2011–2018. MQI was calculated as grip strength (kg) / limb skeletal muscle mass (kg). Sleeping data was assessed using the PSQI, including total and seven component scores. Multivariable linear regression adjusted for age and sex was used to evaluate associations between MQI and PSQI scores. The significance level was set at 5%. To compare sleep timing between high and low MQI groups, defined based on the median, a circular general linear model adjusted for age and sex was used. Variables were considered valid if any 95% highest probability density intervals for the effect size exclude 0.

Results : Among 1,285 participants, the higher PSQI total score was significantly associated with lower MQI (β = -0.032). The order of significant components was as follows: c3 (sleep duration: β = -0.079), c2 (sleep latency: β = -0.064), c4 (habitual sleep efficiency: β = -0.137), and c1 (subjective sleep quality: β = -0.067), all $p < 0.01$. Higher MQI group had earlier bedtime and sleep onset, but no difference in wake-up time.

Conclusion : Lower MQI is associated with specific aspects of poor sleep such as shorter sleep duration, longer sleep latency, and delayed sleep timing. These findings expand previous research by evaluating MQI in relation to multiple PSQI components, rather than a single sleep item. MQI may be useful as a marker of early functional decline in younger populations.

Association of PPSV23 with Parkinson's and Alzheimer's Disease Risk: The VENUS Study

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Background : Recently, attention has been paid to the off-target effects of various vaccines. The protective effect of the 23-valent pneumococcal polysaccharide vaccine (PPSV23) against Parkinson's disease (PD) and Alzheimer's disease (AD) has not been extensively investigated.

Methods : This population-based nested case-control study aimed to evaluate the association between PPSV23 vaccination and the risk of neurodegenerative diseases, specifically PD and AD, among Japanese adults aged ≥65 years. Data were extracted from the Vaccine Effectiveness, Networking, and Universal Safety (VENUS) Study, which included healthcare claims and vaccination records collected between April 2014 and December 2023. PPSV23 vaccination status was identified from municipal vaccination records. Adjusted odds ratios (aORs) and their 95% confidence intervals (CIs) were estimated using conditional logistic regression.

Results : Among 858,857 individuals aged ≥65 years, 14,645 PD cases and 66,921 AD cases were matched with 73,082 and 331,283 controls, respectively. PPSV23 vaccination was significantly associated with a reduced risk of PD (aOR=0.91, 95% CI: 0.86–0.97) and AD (aOR=0.79, 95% CI: 0.77–0.82). The protective effects were more pronounced among individuals with vaccination within the median follow-up period of 1080 days (PD: aOR=0.89, 95% CI: 0.83–0.96 for ≤1080 days; aOR=0.96, 95% CI: 0.87–1.05 for >1080 days. AD: aOR=0.77, 95% CI: 0.74–0.80 for ≤1080 days; aOR=0.84, 95% CI: 0.80–0.87 for >1080 days).

Conclusion : PPSV23 vaccination was associated with a reduced risk of developing both PD and AD in Japanese older adults. Further investigations are needed to strengthen the evidence base on the utility of PPSV23 vaccinations for PD and AD prevention.

Association of rapid eye movement sleep and cognitive decline: A population based prospective study

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Background : Rapid eye movement (REM) sleep associated cognitive decline is not well-known. We investigated the relationship between REM sleep and cognitive decline over 8-year follow-up.

Methods : This prospective cohort study was conducted in a community-based adult population (avg. age 57.8 years) who underwent both in-home overnight polysomnography (PSG) and comprehensive neuropsychological tests at baseline (year 2011-2014). The participants were followed-up with the same neuropsychological test battery 4-yearly in two more cycles (in year 2015-2018 and 2019-2022). A total of 1,875 participants who were cognitively intact at baseline were analyzed. REM sleep% was defined as the proportion of total sleep time spent in REM sleep, extracted from PSG. The main outcomes were multivariable adjusted mean differences of cognitive test performances by REM sleep% tetiles over time. We used linear mixed model for repeated measurements to compare the means (95% CIs) by REM sleep% tetiles.

Findings : The cognitive test scores were not significantly different among the tertiles at baseline. After adjusting for potential confounding factors, participants in the lower tertile performed significantly worse than the upper tertile of REM sleep% participants in Verbal Fluency (letter) [β = -1.23 (95% CI: -2.42 – -0.03), p=0.04]; Trail Making Test–A [β = 2.72 (95% CI: 0.78 – 4.70), p=0.006]; Digit Symbol–coding [β = -3.37 (95% CI: -5.48 – -1.30), p=0.001] and Stroop–color reading [β = -2.65 (95% CI: -4.21 – -1.08), p=<0.001] at 8-year follow-up. Compared to the middle tertile of REM sleep%, the lower tertile performed worse only in Stroop–color reading [β = -1.55 (95% CI: -3.09 – -0.01), p=0.04].

Interpretation : In this prospective cohort study, lower REM sleep% was independently associated with worse executive functioning and processing speed over 8-year follow-up period in this Korean middle-aged and older general population.

Genome-wide association study on longitudinal & cross-sectional traits of child health & development

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Understanding the influence of both genetics and environment on human health, especially early in life, is essential for shaping long-term health. Here, we utilize a nationwide prospective birth cohort, the Japan Environment and Children's Study (JECS), to conduct a large-scale population-based genetic study using biannual questionnaire surveys and biological and physical measurements collected from both parents and their children since the participant mothers were pregnant. Analyses of genome-wide genotyping for 80,639 child participants with parental consent and sufficient DNA from cord blood samples represent the genetic diversity of the general population in Japan. Systematic genome-wide association studies of 1,148 child health and developmental traits (including, e.g., food allergy, anthropometry measurements or ASQ-3 developmental screening) and parental environmental exposure traits (including, e.g., mercury or PFAS exposure) identify 5,685 common genomic loci (2,218 of which passed the phenome-wide significance threshold P=4.4 × 10^-11), of which 15-17% of loci represent novel associations not previously reported, including potential future therapeutic targets. Additional longitudinal GWAS of BMI, using Gaussian process regression, identified 153 novel dynamic genetic associations throughout child development. These associations can also be used to predict an individual's growth trajectory based on their genetic background. In addition, genetic correlation analysis suggested some evidence that maternal environmental exposures during pregnancy influence child traits at birth. Together with studies of genetic risk factors and environmental exposures, across time and multiple outcomes, these demonstrate the uniqueness and value of the JECS data.