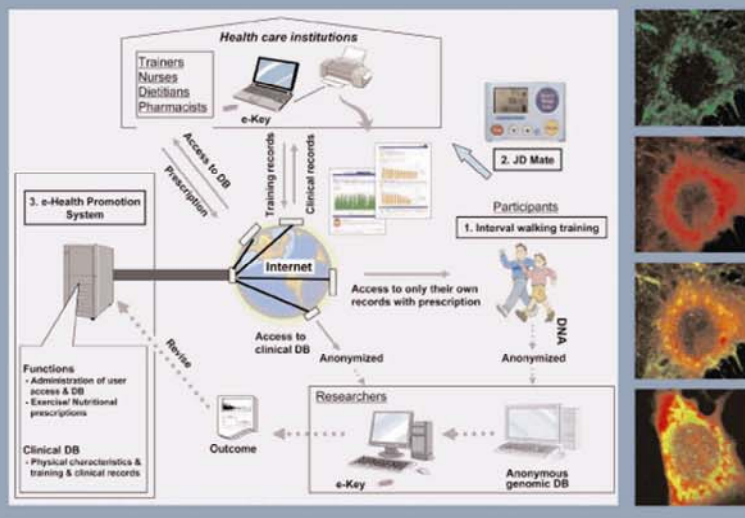


The Journal of Physiology

Volume 587 Number 23
1 December 2009

A Publication of The Physiological Society

Physiological regulation linked with physical activity and health



インターバル速歩、
e-ヘルスプロモーションシステム、
そして、熟大メイトが、
生理学で世界最高水準の英専門誌

「The Journal of Physiology」の
表紙を飾りました。

Protein and carbohydrate supplementation increases aerobic and thermoregulatory capacities

Kanemitsu Okazaki, Masaki Goto and Hiroshi Nose
Department of Sports Medical Sciences, Shinshu University Graduate School of Medicine, Matsumoto 985-8612, Japan

Genetic basis of inter-individual variability in the effects of exercise on the alleviation of lifestyle-related diseases

Maruyama Mori^{1,2}, Keiichi Higuchi¹, Akio Sakurai¹, Yumiko Tabara¹, Tetsuo Miki¹, Hiroshi Nose^{1,2}
Department of Sports Medical Sciences, Shinshu University Graduate School of Medicine, Matsumoto 985-8612, Japan

Beyond epidemiology: field studies and the physiology laboratory as the whole world

Hiroshi Nose^{1,2}, Masaki Morikawa^{1,2}, Toshiki Yamazaki^{1,2}, Ken-ichi Nemoto¹, Kanemitsu Okazaki¹, Shime Masaki¹, Yoshi-ichiro Kamijo¹ and Hiroshi Nose^{1,2}
Department of Sports Medical Sciences, Shinshu University Graduate School of Medicine, Matsumoto 985-8612, Japan

There is no much training regimen broadly available in the field to increase physical fitness and prevent lifestyle-related diseases in middle-aged and older people. We have developed interval walking training (IWT) repeating five or more sets of 1 min fast walking at $\geq 70\%$ peak aerobic capacity for walking ($V_{O_{2max}}$) per day with intervening 5 min slow walking at $40\% V_{O_{2max}}$ for 24 days/week¹, for 2–3 months. Moreover, to determine $wV_{O_{2max}}$ in individuals and also to measure their energy expenditure even while incline walking, we have developed a portable calorimeter. Further, to instruct subjects on IWT, even if they live remotely from the trainers, we have developed e-Health Promotion System. This transfers individual energy expenditure during IWT stored on the meter to a central server through the internet; it sends back the achievement to individuals along with advice generated automatically by the server according to a database on ≥ 4000 subjects. Where we found that 8 months of IWT increased physical fitness and improved the indices of lifestyle-related diseases by 10–20% on average. Since our system is run at low cost with fewer staff for more subjects, it enables us to develop exercise prescriptions appropriate for individuals.

Received 27 July 2009; accepted after revision 10 September 2009; first published online 11 September 2009
Corresponding author H. Nose, Department of Sports Medical Sciences, Shinshu University Graduate School of Medicine, 1-1-1 Asahi Matsumoto 985-8612, Japan. Email: nose@shinshu-u.ac.jp

Introduction

The rapid growth in the elderly population in many countries has highlighted the importance of exercise training to decrease the likelihood of disability and age-associated diseases. In Japan, the population over 65 years old was 20.8% of the total in 2008 but will increase to over 30.3% by 2025 (National Institute of Population and Social Security Research, 2008). One of the serious problems is the rapid increase in the number of older people than healthcare cost. In 2008 it was 17.1 trillion JPY (127 billion USD) but is estimated to increase to 56 trillion JPY (540 billion USD) in 2025 (Ministry of Health and Welfare, 1991), equivalent to 63.2% of the annual national budget in 2008.

This review was presented at The Journal of Physiology Symposium: Physiological regulation linked with physical activity and health, which was held at the 10th International Symposium of Physiological Sciences in Kyoto, Japan on 31 July 2009. It was recommended by the Editorial Board and reflects the views of the authors.

Facing this national crisis, in 2008, the Japanese government issued a law to reform the medical system to provide preventive medicine (Health Insurance Reform, 2007) by which people are obliged to receive a health check for age- and lifestyle-related diseases when they reach 40 years old and, if abnormal results are indicated, they are encouraged to receive nutritional and/or exercise prescriptions at local health care institutions. It is well known that an exercise prescription should conform to individual physical fitness to achieve particular effects (Armstrong et al. 2006); however, no guidelines have been provided by the government, possibly because an exercise prescription would cost more than the standard walking training and also because there is little evidence to suggest that exercise prescription for individuals saves more clinical expenditure than the development cost.

In accumulative evidence, we have implemented a health promotion exercise programme for people ≥ 40 years old, named the 'Johansen Taiikushigaku Program', since 1997 and developed five exercise training formats for

The incidence of heat illness and heat stroke is greater in older than younger people. In this

case in older people may provide to (PV) improve thermoregulation that changes in PV in response to protein-carbohydrate beverage increased PV and plasma fluids. We also examined whether if thermoregulation by increasing a received at moderate intensity, at either placebo (CNT), 0.5 kcal, 0.18 g protein kg⁻¹ immediately 5°C that increases in unshaded NT and associated with enhanced also results in young subjects after protein and CHO consumption subjects and provide insight into plenary adaptations to exercise in

of walking programme, improves sen, such as obesity, hypertension from shown to differ substantially literature has demonstrated that variability in the improvement training. However, the fractions all (Nose). Also, it is likely that more and subject characteristics, to exhaustively identify such gene molecular genetic mechanisms by the improvements of risk factors. A better understanding of the to optimize the treatment and

Received 1 September 2009; revised 10 September 2009; accepted 11 September 2009
Corresponding author H. Nose, Department of Sports Medical Sciences, Shinshu University Graduate School of Medicine, 1-1-1 Asahi Matsumoto 985-8612, Japan. Email: nose@shinshu-u.ac.jp

respiratory fitness, leading to the epidemic of lifestyle-related diseases. In addition, cardiovascular fitness generally deteriorates with advancing age, middle-aged and older individuals another high-risk group for lifestyle-related diseases, increasing cardiovascular fitness effective measures in the prevention and of lifestyle-related diseases. Our commonly used approach for increasing cardiovascular fitness for decreasing the risks of, or alleviating the

If lifestyle-related diseases is habitual exercise low cost, non-pharmacological intervention able to the vast majority of people (Kraus Preschello et al. 2004; O'Gorman & Knorr, 2005), it has also become evident that the

Received 11 September 2009; accepted 11 September 2009
Corresponding author H. Nose, Department of Sports Medical Sciences, Shinshu University Graduate School of Medicine, 1-1-1 Asahi Matsumoto 985-8612, Japan. Email: nose@shinshu-u.ac.jp