

ORAL PAPER PRESENTATION 3: PHYSICAL AND MENTAL HEALTH

The exercise load of the elderly with different physical capacity based on PCA and K-means clustering

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Purpose Population aging is an emerging global issue. For the older adults, physical function inevitably declines with age, while exercise is convinced to improve physical functioning and performance in activities of daily living (Chou, Hwang, & Wu, 2012). American College of Sports Medicine (ACSM) recommends moderate to vigorous exercise for older adults. The exercise intensity can be detected objectively by percentage maximal heart rate (%HRmax) (Meyer, Gabriel, & Kindermann, 1999). In practice, fitness practitioners evaluate the physical capacity of the elders by the senior fitness test (SFT) (E & J, 1999) and provide further health promotion courses for elders. However, the performance of SFT and the reflected exercise intensity during exercise intervention are rarely studied. This study elucidated the correlation between physical fitness performance and reflected exercise intensity during a 11-week training course. **Method** Twenty female participants aged 50 years were joined the health promotion courses which were conducted by the upper extremity ergometer (UEE) and lower extremity ergometer (LEE). Before the intervention, the SFT of each participant was evaluated. The participants were then instructed to exercise with UEE and LEE for one session per week, 30 min per session, respectively, for 11 weeks. The heart rate of the participants during exercise were collected by smart wristband with a sampling frequency of 1 Hz. The %HRmax was calculated as previous described (Tanaka, Monahan, & Seals, 2001). We used principal component analysis (PCA) (Abdi & Williams, 2010) to reduce dimensionality of SFT data. Elbow method was used to determine the optimal value of k (Figure 1). **Results and Discussion** Participants' physical performance from low to high SFT was then divided into 3 clusters by K-means clustering. We further plotted the average %HRmax in each UEE (Figure 2) and LEE (Figure 3) session of the 3 clusters of participants. The result reveals that, with similar exercise interventions, those with better physical fitness showed relatively less reflected exercise intensity (%HRmax), either in upper extremity training or lower extremity training. We believe that this study will provide more insights for fitness practitioners. Continuing to collect more data will be used in the establishment of intelligent exercise prescriptions.

References

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Keywords: senior fitness test, percentage maximal heart rate(%HRmax), PCA, K-means clustering

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Acknowledgement This work was supported by Ministry of Science and Technology (MOST 110-2627-M-006-006-) and also financially supported by the Medical Device Innovation Center, National Cheng Kung University from the Higher Education Sprout Project by the Ministry of Education in Taiwan.

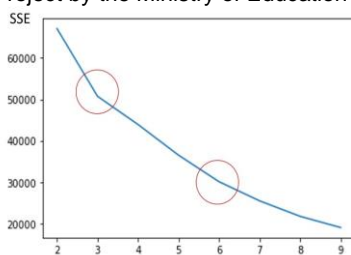


Figure 1. Elbow method to determine the optimal value of k.

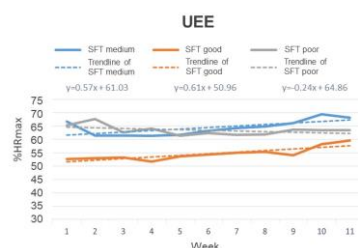


Figure 2. The average %HRmax in each UEE session of the 3 clusters.

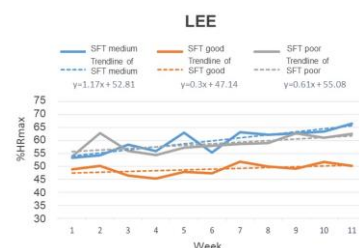


Figure 3. The average %HRmax in each LEE session of the 3 clusters.