4. Recommended Nutrient Intakes for Malaysia (2005). National Coordinating Committee on Food and Nutrition, Ministry of Health.
5. WHO (1994). Assessment of fracture risk and its application to screening for postmenopausal osteoporosis: a report of a WHO Study Group. Geneva: World Health Organisation.

## Poster presentation (PP)

### PP2-09 Motor Learning 1/1 - "Exhibition Hall"

#### THE EFFECT OF AUGMENTED FEEDBACK ON THE FOOTSTEPS LEARNING

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Among the different variables known to affect learning in physical practice context, augmented feedback following the completion of the response is considered to be one of the most important (Schmidt & Lee, 1999) and a necessary phase that the learner must go through in order to reach the autonomous stage where movement control is more or less automatic (Masters and Maxwell, 2001). These observation are discussed in view of the benefits and pitfalls of augmented feedback in relation to task context and instructional condition (Badets & Blandin, 2004).
101 volunteers, aged from 16 to 31 years (M=23; sd=3,76) were required to perform complex skill by "all music dance". It was originally composed by an electronic game in which the player had to follow the luminous arrows sequence on the screen with the dance mat controller. No participants had prior experience with the performance on the task. The software assigned a score in function of spatial and temporal precision. Scoring could see on video during the practice.
The protocol is composed by three phases:
In the test phase, three different footsteps sequences in order of difficulty were performed by all subject after a baseline test.
During second phase, the participants was divided into two homogeneous groups:
 one group (56 participants) acquired a footsteps movement with normal vision of performance and results in real time (with augmented feedback);
 another group (45 participants) performed the complex skill without augmented feedback.
The latter group performed the task on posters that reproduced the arrows like the original, so participants didn't knew knowledge of performance (KP) and knowledge of results (KR). Both group exercised thrice in each footsteps sequences.
In the last phase all subjects reproduced the footsteps sequences on mat controller.
The test refers to the score obtained from the first experience and the re-test refers to the score obtained from the last phase.
One ways ANOVA 2 groups (with and without augmented feedback) revealed that the augmented feedback encourage skill learning (F=(1,99)116,42; p=.000) (Wallace and Hagler, 1979). In fact learners who practiced with augmented feedback showed a further performance improvement relative to the end of practice, like as report in literature (Wulf, Shea and Park, 2001).

#### MECHANICAL EFFICIENCY AND MUSCULAR CONTROL VARIATIONS IN CYCLING BY USING DIFFERENT TRAINING INFORMATION PROCDURES

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Introduction. The efficacy of cycling concerns the biomechanical relationship between the cyclist and the bicycle as well as the muscle activity patterns. Tangential crank force can increase (pushing) or decrease (breaking) the propulsion total net torque. Subjects show various capacity of motor and sensory cues to match the biomechanical demands especially in the transition between extension and flexion. The aim of this study was to investigate the effectiveness of different training information procedure to improve the biomechanical efficiency of pedaling.
Methods. Tangential and radial crank forces were recorded at 100 Hz by a special system (Powertec). EMG (Biovision) of principal muscles (RF, VM, BF, TA, GAS, SO) was made according to the SENIAM guidelines. RMS and IEMG values were calculated. 2-D kinematics of the legs were calculated via video analysis (SIMI). Two groups of cyclists participated in the experiment (PC= 6 professional , NC= 6 sport students). Subjects complete pedaling items with 70 b/min cadence, 1 minute duration and under four loading conditions (100, 150, 200, 250 W), 3 minutes rest between loads and no fatigue. Items were carried out in the following sequence: I-1) actual technique, I-2) repeat first item receiving visual information on the shape of the tangential force after each previous load, I-3) pedaling with online visual feedback on the shape of the tangential force for the left and right leg separately, I-4) repeat all the loading steps without information. After two days subjects were required to repeat item I-4. Results. Most of the subjects reveal a breaking action of the legs during the upwards phase crank. This negative effect was more pronounced at 100W load. After I-2 no substantial variations on the tangential force were observed for both groups. Some subjects modified the force profile, but not necessary increasing the efficiency. During online feedback, all subjects were able to modify correctly the force curve and to obtain an increased biomechanical efficiency. During item I-4 the new technique was well reproduced and different kinematics and EMG adaptations between groups, with respect to the I-1 technique, were depicted. NC have greater and PC lower knee extension, while the flexion was the same as in I-1. Ankle extension angle was reduced in PC for all the loads, while in NC it was lower for 100W and greater for 250W loads. Ankle flexion showed similar values with respect to I-1, but was greater in NC (75° vs 65°).Some muscles showed identical variations for both groups, TA increased and VM and SO decreased activity. GM decreased significant only for PC and RF increased for PC and decreased for NC. BF showed no clear tendency. After two days, most of the subjects were able to reproduce the new acquired force patterns. In order to obtain a comprehensive view of this locomotor adaptations, especially for long duration effort, analysis of the metabolic efficiency should complete this approach.