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ORIGINAL ARTICLE

The Effects of an Activity Promotion System on active living in overweight subjects with metabolic abnormalities

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KEYWORDS

Physical activity;
Activity promotion;
Self-management;
Metabolic abnormalities;
Overweight

Summary:

Objectives: The aim of this study is to examine the effects of Activity Promotion System (APs) on promoting physical activity (PA) for overweight subjects with metabolic abnormalities.

Methods: We designed a six-month randomised controlled trial with a cross-over design, and recruited 53 subjects. Subjects in group A used APs with a wearable device measuring whole-day PA, including sleep time, sedentary, light, moderate and vigorous PA and a web-based feedback system in the first three months and followed by usual care with traditional health education in the next three months. Subjects in group B received the above programs in a reverse order. PA and metabolic profiles were measured prior to the intervention (T1), three months after the first intervention (T2), and six months after the other intervention (T3), respectively. An independent t test was used to test the differences between periods with and without APs.

Results: This study found that the APs had short-term effects on decreasing sedentary time and increasing mild PA, total PA, daily step counts, and calories burnt. With regard to the secondary outcome measures of metabolic abnormalities, the results showed that APs had had no effect on metabolic abnormalities, except a borderline decreasing of waist circumference.

Conclusion: Using this APs might be an effective approach to decrease sedentary time and increase PA for an overweight non-elderly adult population with only metabolic abnormalities. However, long-term studies with APs are needed to further confirm the effectiveness of this innovative Activity Promotion System.

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Introduction

Metabolic abnormalities are the risk factors of cardiovascular disease (CVD), including overweight/obesity, central obesity, insulin resistance, hypertension, and atherogenic dyslipidemia [1,2]. These metabolic abnormalities might induce the development of CVD, diabetes and cancer [3,4]. With regard to the changes in the prevalence of metabolic abnormalities in Taiwan, a 12-year follow-up study showed that the prevalence of high waist circumference (WC), high blood pressure, hyperglycemia, hypertriglyceridemia, and low high density lipoprotein-cholesterol (HDL-C) all increased during the period 1997–2009 in both male and female subjects [5]. At present, both obesity and metabolic syndrome (MetS) are major public health issues for developing and developed countries.

The beneficial effects of physical activity (PA) in decreasing metabolic risks are well-known to the public [6–8]. However, a survey by the Health Promotion Administration showed that one-fifth of Taiwanese adults did not exercise, and two-thirds exercised less than three times per week [9]. An annual national sports city survey, examining the prevalence of various physical activity participation in citizens with different occupations, found that retired individuals had the highest overall PA, while white-collar workers had the lowest scores in

every aspect of PA, including work-related, leisure-time and transportation-related PAs [10]. Young and middle-aged adults who have cardiovascular risks without dietary control and exercise are more likely to suffer CV events and develop CVD early [3]. In addition, individuals with chronic diseases often find it difficult to change their behaviours without further motivation, and spending more time exercising is often difficult for those with only one or two metabolic abnormalities. However, the development of chronic diseases is related to early lifestyle, and thus early prevention should be provided to the general population or individuals at high risk of developing chronic diseases [3,11].

Prolonged sedentary time has harmful effects with regard to chronic diseases [12–17]. Sedentary behaviour is a common unhealthy life style, and sedentary behaviour is a common unhealthy life style, and there are a growing number of studies regarding the independent unhealthy effects of sedentary time [12–20]. Previous studies reported that sedentary time is associated with a variety of chronic diseases and related risk factors [16–20], including MetS, obesity, diabetes, CVD and all-cause mortality [16–17,20–23] and reducing sedentary time could decrease these risks [6,12,14,20,24]. However, few investigators have paid attention to sedentary behaviours, and those that did consider this issue did not measure sedentary time specifi-

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