

Effectiveness Analysis on the Physical Activity and the Health Benefit of a Community Population Based Program*

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Abstract

Objective To evaluate the community-based health promotion effect of physical activity.

Methods The residents aged 18 and above from two communities in Gongshu District of Hangzhou City, Zhejiang province, were randomly selected and recruited for the multi-strategy and comprehensive physical activity intervention. Questionnaire survey, physical check up and blood biochemistry were conducted.

Results After this two-year intervention, the time of the participant spent on weekly physical activity of moderate intensity increased from 464 min to 542 min ($P<0.05$), with an average increase of 78 min. Time spent in walking every week increased from 533 min to 678 min ($P<0.05$), with an average increase of 145 min. The body weight, waistline, blood pressure and heart rate all reduced significantly ($P<0.05$); the vital capacity increased significantly ($P<0.05$); and the related biochemical indicators were also improved.

Conclusion Comprehensive and evidence-based physical activity interventions targeting community population can improve the levels of physical activity, related body measurement and biochemical indicators.

Key words: Physical activity; Community population; Health promotion; Walking

Biomed Environ Sci, 2013; 26(6):468-473 doi: 10.3967/0895-3988.2013.06.007 ISSN:0895-3988
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INTRODUCTION

The proportion of sedentary residents in China has continuously increased due to rapid expansion of urbanization, increased

number of vehicles, continuously declining of physical labor intensity, excessive time spent on TV watching and among others in China. Long time sitting with less movement has becoming a prominent characteristic of the contemporary

*This work was supported by the ILSI Research Foundation.

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Received: August 29, 2012;

Accepted: December 26, 2012

lifestyle. The situation of few physical activities of residents is more serious in many countries, and 40%-50% of Chinese residents now are lack of physical activity. Chinese residents aged 18 and above with no physical exercises accounted for 83.8% in 2010, while only 11.9% of residents aged 18 and above do physical exercises (referring to physical activity for at least ten minutes each time and three times a week) on a regular basis and the average daily time for static behaviors in spare time was 2.7 h^[1]. Physical activity brings additional health benefits other than nutrition and diet. The reduction of physical activity will make energy intake exceed energy use and cause imbalance, thus leading to body fat accumulation and increasing risk at obesity, diabetes, hypertension and other non-communicable diseases^[2]. Lack of physical activity has already become the fourth major cause of death around the world, only following hypertension (13%), use of tobacco (9%) and hyperglycemia (6%). It's estimated that about 21%-25% of breast cancer and carcinoma of the rectum, 27% of diabetes and 30% of ischemic heart disease result from lack of physical activity^[3]. According to the major monitoring results of non-communicable diseases and their risk factors at national disease surveillance points in 2010 and the criteria for judging overweight and obesity of Chinese adults, the overweight rate and obesity rate of Chinese residents over 18 years old were 30.6% and 12.0% respectively^[1]. Also, non-communicable diseases have become the main cause for death of Chinese urban and rural residents, and the proportions of death have reached 85.3% and 79.5% respectively. Therefore, it is imperative to take measure to prevent non-communicable diseases through health promotion of physical activity to change sedentary lifestyle. Some literatures reviewed the findings on community-based and comprehensive physical activity intervention across the world. Although an abundant amount of scientific evidence has shown that physical activity can enhance health, there are few practices transferring scientific evidence into public health interventions at the moment^[4]. China is no exception. This research aims to evaluate a two-year community-based health promotion effect of physical activity which was launched in September 2007.

METHODS

Research Sites and Subjects

Gongshu District, Hangzhou City, Zhejiang

province was selected as the site for the implementation of this physical activity intervention. The cluster sampling method was used to recruit residents over 18 years old living in two communities in Gongshu District for the study. All the participants signed the Informed Consent Form before the start of intervention. This research was approved by the Institutional Review Board of Chinese Center for Disease Control and Prevention.

Evaluation Indicators and Method

Questionnaire survey, physical check up and blood biochemistry was used for evaluating the improvement of participants' levels of physical activity and health conditions before and after the intervention. Enumerators were distributed to the communities before and after the intervention and they gave answers to participants' inquiries about the questionnaire, and assisted them in filling out the form while making arrangements for physical check up and biochemical samplings. Evaluation indicators for physical activity including time spent on walking and weekly physical activity were acquired by questionnaire survey. Evaluation indicators for health conditions include height, weight, waistline, systolic pressure, diastolic pressure, heart rate, vital capacity, fasting blood-glucose (tested by glucose oxidase kit, GOD-PAP), total cholesterol (tested by COD-PAP), triglyceride (tested by GPO-PAP), and high density lipoprotein (tested by Chemistry Modify Enzyme Method).

Intervention Strategies

Interventions were conducted by strictly following the principle of promoting comprehensive and community population-based physical activity. Specific intervention strategies include multi-department cooperation, media publicity and building of a supportive environment, in order to encourage residents to engage in walking exercise, increase their health awareness and improve their physical activity skills.

Statistical Method

The data obtained were analyzed by SAS software. Chi square test was performed for enumeration data. Student *t* test was performed for measurement data. $P < 0.05$ means the difference is statistically significant.

RESULTS

Multi-sector Cooperation

A working group was established at the beginning of the program being responsible for the consultancy, management, execution, and technical guidance. Members of the working group came from the Chinese Ministry of Health, the Chinese General Administration of Sport, the ILSI China Focal Point, the Chinese Center for Disease Control and Prevention, the District Government of Gongshu of Hangzhou City, the Gongshu District Federation of Trade Unions, the Women's Federation, the Bureau of Culture, the Bureau of Sport, the Bureau of Business and Tourism, the Bureau of Health, the Center for Disease Control and prevention, the Maternal and Children's Care Centre. This working group has fully represented the multi-sector cooperation mechanism for the effective ensuring the reasonable allocation and utilization of the forces of all parties for the program. The District Government of Gongshu elected its deputy director as the leader of the onsite working group. Figure 1

shows institutions responsible for organization and implementation of the program as well as their separate responsibilities.

With the strong support and cooperation of the Gongshu district government, a walking friendly Healthy Trail was constructed along the Beijing-Hangzhou Canal. A series of attractive signs were set up at different locations along both sides of the trail to remind people of being physically active and help them identify directions, distances, and energy expenditure. All the signs are nightly illuminated. Meantime, a theme park with healthy lifestyle elements was also set up. Mass media including Zhejiang Satellite TV, *Zhejiang Daily* and *Hangzhou Daily* etc. reported the program progress for 11 times and these widely publicized the importance of physical activity, guideline for exercises and other health messages, encouraged the general public to participate in walking along the Healthy Trail, and greatly enhanced awareness of residents on health in the communities and physical activity level of the local residents BMI calculate rulers, salt spoons, and oil jugs were delivered to participants for the healthy lifestyle.

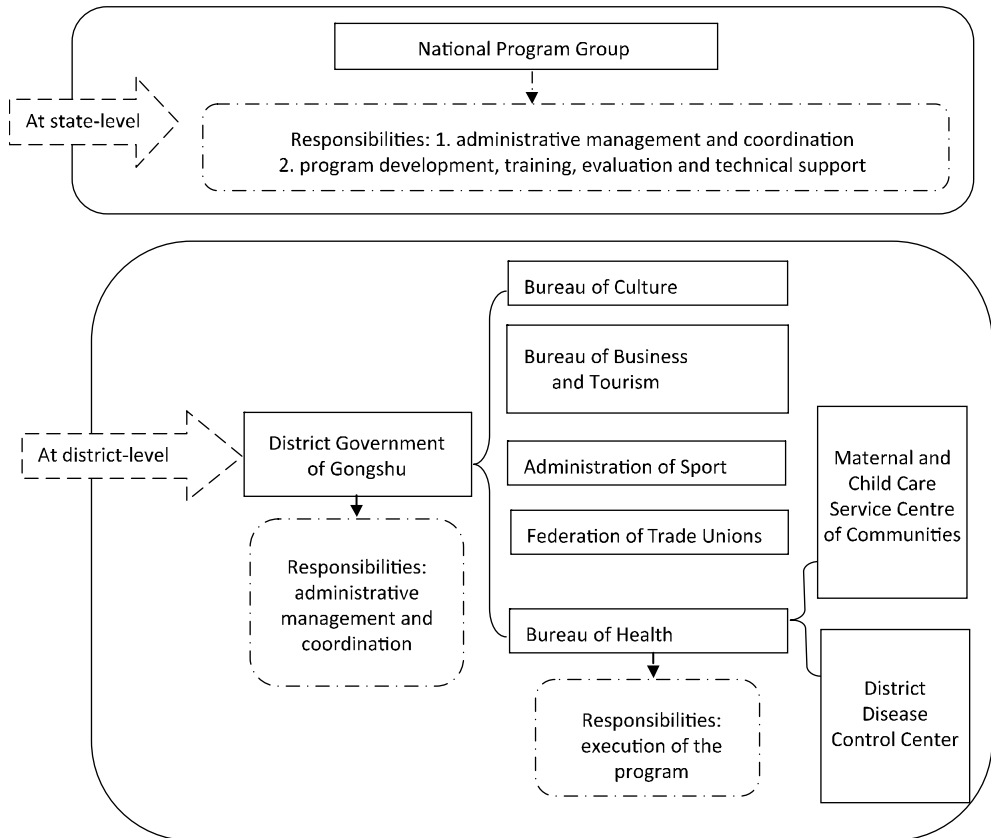


Figure 1. Organization structure of the program.

Improvement in Physical Activity and Health Conditions

A total of 1269 people were involved in the on-site survey before the intervention, including 507 males (40.0%) and 762 females (60.0%). After the intervention, a total of 1221 people were involved in the on-site survey, including 490 males (40.1%) and 731 females (59.9%), with an average age of 55.8.

Physical Activity Levels of the Participants

After this two-year intervention, the time of the participants spent on moderate-intensity weekly physical activity increased from 464 min to 542 min ($P<0.05$), with an average increase of 78 min. The time of the participants spent on heavy-intensity weekly physical activity increased from 163 min to 189 min ($P<0.05$), with an average increase of 26 min. The number of local residents engaged in walking exercise increased by 9% after the intervention, and

the time spent on weekly walking increased from 533 min to 678 min ($P<0.05$), with an average increase of 145 min. The specific data are shown in Table 1.

Indicator Value of Physical Check up of the Participants

Table 2 shows that the weight, waistline, blood pressure and heart rate of the participants reduced significantly ($P<0.05$), while their vital capacity increased significantly ($P<0.05$).

Indicator Value of Biochemistry of the Participants

Table 3 shows that after this two-year intervention, the fasting blood-glucose and triglyceride reduced significantly ($P<0.05$) while the high density lipoprotein cholesterol increased significantly ($P<0.05$), and the difference in total cholesterol was not significant.

Table 1. Physical Activity Levels and Walking Exercise of the Participants (Mean±Sd)

| | Before Intervention | After Intervention | P |
|---|---------------------|--------------------|-------|
| Time of the participants spent on heavy-intensity weekly physical activity (min/week) | 163.5±273.5 | 189.1±284.4 | <0.05 |
| Time of the participant spent on moderate-intensity weekly physical activity (min/week) | 464.2±328.7 | 541.9±316.5 | <0.01 |
| Number and proportion of the participants engaged in walking exercise | 824 (65%) | 898 (74%) | <0.01 |
| Time of the participants spent on weekly walking (>10 min) (min/week) | 533.0±282.9 | 677.8±260.5 | <0.01 |

Table 2. Indicator Value of Physical Check up of the Participants before and after the Intervention (Mean±Sd)

| | Before the Intervention | After the Intervention | P |
|--------------------------------------|-------------------------|------------------------|-------|
| Weight (kg) | 61.3±10.2 | 60.4±9.4 | <0.05 |
| Body mass index (Kg/m ²) | 23.1±3.0 | 22.8±2.9 | <0.05 |
| Waistline (cm) | 79.0±9.3 | 77.1±7.7 | <0.01 |
| Systolic pressure (mmHg) | 125±15 | 124±12 | <0.01 |
| Diastolic pressure (mmHg) | 78±8 | 77±7 | <0.01 |
| Heart rate (beat/min) | 75.5±6.2 | 74.7±4.7 | <0.01 |
| Vital capacity (mL) | 1950±740 | 2172±747 | <0.01 |

Table 3. Indicator Value of the Biochemistry of the Participants before and after the Intervention (Mean±Sd)

| | Before the Intervention | After the Intervention | P |
|-----------------------------------|-------------------------|------------------------|-------|
| Fasting blood-glucose (mmol/L) | 5.25±0.83 | 5.10±0.59 | <0.01 |
| Total cholesterol (mmol/L) | 4.61±0.88 | 4.56±0.71 | >0.05 |
| Triglyceride (mmol/L) | 1.42±0.81 | 1.36±0.59 | <0.05 |
| High density lipoprotein (mmol/L) | 1.18±0.35 | 1.23±0.29 | <0.01 |

DISCUSSION

Moderate to heavy-intensity physical cardiopulmonary activity or exercise can help reduce the death rate^[5]. The fact that hypertension, diabetes, cardiovascular and cerebrovascular diseases and other non-communicable diseases can be contained or even controlled by having more physical exercises is supported by scientific evidence and widely accepted^[6]. Engaging in physical activity during work or daily lives can help improve the quality of life. Our findings from the present study showed that after the two-year intervention, time of the participants spent on moderate-intensity weekly physical activity increased in average by 78 min. The weight, waistline, blood pressure and heart rate reduced significantly while the vital capacity increased significantly, indicating that this intervention can improve the level of physical activity and bring about health benefit.

This study focused on transforming evidence-based health knowledge into intervention practices so that to fill the gap between theory and practice in the public health field. Along with the rapid urbanization in China, the urban population increased from 29.04% in 1995 to 44.94% in 2007^[7]. And communities in urban area have becoming a very important place and the first line for health services providers and interventions activities. Being different to other non-communicable diseases intervention conducted in Hangzhou, this intervention is innovative in that it was specially designed for the health promotion of physical activity and was characterized with a multi-sector participation strategy as mentioned above in this paper. In addition, the mass media was mobilized to publicize and report the progress of the program. Moreover, as the intervention was community-based, the survey respondents came from all walk of the society. And the findings from the interventions showed the effect of comprehensive and community-based health promotion on physical activity in the 'real' communities.

Walking is considered as a major part of daily physical activity and the most common exercise. The monitoring data from US on physical activity of the population showed that walking is the most common way of having recreation and keeping fit^[8]. A study in Australia also showed that walking was the most common exercise for adults. The intensity, time spent and frequency of walking can be adjusted by

pedestrians based on their own personal situations. Besides, walking is also an important indicator of individuals' health and physical conditions^[9]. Walking for 30 min every day can increase the amount of physical activity^[10]. *Dietary Guidelines for Chinese Residents (2007) recommended* that adults should engage in walking over 6000 steps every day^[11].

Findings from our present research showed that the time of the participants spent on weekly walking increased by 145 min after interventions and this demonstrated the effectiveness of the intervention strategy of encouraging walking exercise. A previous physical activity promotion program in USA based on walking promotion were conducted by means of group activity and fitness club, which can promote the cohesiveness of participants^[12]. Using this for the reference and considering the social and cultural characteristics of the participants, the present research encouraged participants to build walking groups consisting of colleagues, neighbors and family members to greatly raise their enthusiasm for the involvement. The program also showed good cooperation with the media, which reported the program progress on a regular basis during the intervention, thus creating an excellent atmosphere with positive public opinion on the promotion of physical activity. Some previous researches in USA showed the difficulties encountered in enabling people, especially people of low and middle income to engage in walking exercise due to lack of supportive environment, unsafe factors and lack of time^[13]. However, our present intervention took advantage of the Beijing-Hangzhou Canal, and integrated healthy elements (Healthy Trail) into it so as to provide the participants with an excellent supportive environment for walking exercise such as by providing clearly labeling the number of steps and distance along the trail, knowledge on energy use and healthy lifestyle, and installing noctilucent signs. And findings from the intervention showed that most of the participants use the Healthy Trail as a place for daily exercise.

We believe that this intervention is meaningful for the policy recommendation and creation of enabling environment for further effort in physical activity health promotion campaign for the general public in China. Multi-sectoral cooperation played an important role in this intervention and setting up of the working group for the program implementation fully reflected this cooperation mechanism, which both fully utilized the resources of each party and inspired their initiatives at work. As pointed out in

the Draft Political Declaration of the High-level Meeting on the prevention and control of non-communicable diseases held in 2011, it should be 'recognized that effective non-communicable disease control and prevention requires multi-sectoral approaches to fully integrate resources for the control and prevention work'^[14]. The intervention strategy adopted in our present intervention complies with the spirit of above mentioned declaration. And from this study, we learned that health department should not be independent for solving health problems but rather to join hands with other sectors through multi-sectoral mechanism to increase the suitability and feasibility in terms of program implementation^[15]. Besides, multi-sectoral participation is good way for the transfer and feedback between policy and scientific knowledge^[16] and can facilitate the sustainability of the program. The involvement and participation of sports, urban construction, culture and other departmental agencies in this intervention well demonstrated the significance and importance of this strategy.

This research also has some limitations, such as seldom involvement and participation of young adult and insufficient data on program cost. However, this intervention showed that it can significantly enhance the physical activity levels of the participants and can improve the health conditions of them. Multi-sectoral cooperation and selection of appropriate means of exercise such as walking can help ensure the effectiveness of the intervention.

ACKNOWLEDGEMENTS

The authors of this paper would like to express their sincere gratitude to the District Government of Gongshu, the Health Bureau and relevant agencies for their great effort and contributions to the program, to the Bureau of Disease Control and prevention, the Chinese Ministry of Health and the Chinese Center for Disease Control and Prevention and, Professor Chen Chun Ming, the ILSI China Focal Point for the support, and to all national and local level colleagues and also the community residents engaged in this program for their understanding, support and participation.

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