Summary
Regular physical activity is considered to be an important component of a healthy lifestyle that decreases the risk of coronary heart disease, diabetes mellitus type 2, hypertension, colon and breast cancer, obesity and other debilitating conditions. Physical activity can also improve functional capacity and therefore also the quality of life in older adults. Despite all these favorable effects, a substantial part of the Dutch older adult population still underactive or even sedentary. To change this for the better, the Groningen Active Living Model (GALM) was developed.

Aim of GALM is to stimulate recreational sports activities in sedentary and underactive older adults in the 55-65 age band. After a door-to-door visit as part of an intensive recruitment phase, a fitness test was conducted followed by the GALM recreational sports program. This program was based on principles from evolutionary-biological play theory and insights from social cognitive theory. The program was versatile in nature (e.g. softball, dance, self-defense, swimming, athletics, etc.) in two main ways: a) to improve compliance with the program different sports were offered, which was reported to be more appealing for older adults; b) by aiming at more components of motor fitness (e.g. strength, flexibility, speed, endurance and coordination). Between 1997 and 2005 more than 552,000 persons were visited door-to-door, over 55,700 were tested, and 41,310 participated in the GALM recreational sports program. The aim of the present thesis is to determine the effects of participation in the GALM recreational sports program on physical activity, health, and fitness outcomes.

Chapter 2 describes the effectiveness of the GALM recruitment in selecting and recruiting sedentary and underactive older adults is described. Three municipalities in the Netherlands were selected, and in every municipality four neighborhoods were included. Two of each of the four neighborhoods were randomly assigned as intervention and the others as control neighborhoods. In total, 8,504 person were mailed and received a home visit. During this home visit the GALM recruitment questionnaire was collected on which the selection between sedentary/underactive and physically active older adults was based. Ultimately we succeeded in including 12.3% (315 of the 2,551 qualifying) of the older adults, 79.4% of whom could be indeed considered sedentary or underactive. The cost of successfully recruiting an older adult was estimated at $84.
Summary

To assess the effects of a physical activity intervention on health and fitness and explain the results, it is necessary to know program characteristics regarding frequency, intensity, time and content of the activities. With respect to the GALM recreational sports activity program, the only unknown characteristic was intensity. Chapter 3 describes the intensity of this program systematically. Using heart rate monitors, data of 97 persons (mean age 60.1 yr) were collected in three municipalities. The mean intensity of all 15 GALM sessions was 73.7% of the predicted maximal heart rate. Six percent of the monitored heart rate time could be classified as light, 33% as moderate and 61% as hard. In summary, the GALM recreational sports program meets the 1998 ACSM recommendations for intensity necessary to improve cardiorespiratory fitness.

Chapters 4 and 5 describe the effects of 6 and 12 months of participation in the GALM recreational sports program, and 181 persons were followed over time. Results after 6 months revealed only few significant between-group differences favoring the intervention group (i.e. sleep, diastolic blood pressure, perceived fitness score and grip strength). Changes in energy expenditure for leisure-time physical activities (EE_{LTPA}) showed an increase in both study groups. From 6 to 12 months a decrease in EE_{LTPA} occurred in the intervention group and an increase in the control group. The significant positive time effects for the health outcomes (diastolic blood pressure, BMI, percentage of body fat) that were found after 6 months were diminished from 6 to 12 months. However, the energy expenditure for recreational sports activities (EE_{RECSPORT}) demonstrated a continuous increase over 12 months. Parallel to this, significant main effects for time were found in performance-based fitness outcomes (i.e. simple reaction time, leg strength, flexibility of hamstrings and lower back, and aerobic endurance). After 12 months only a significant between-group difference for flexibility of the hamstrings and lower back was found, favoring the control group. In conclusion, a short-term increase in EE_{LTPA} was found with accompanying improvements in health outcomes that more or less disappeared in 6 to 12 months. In the long term, results showed a continuous increase in EE_{RECSPORT} and performance-based fitness. This latter increase is probably a reflection of the significant improvement over time in EE_{RECSPORT} and the fact that recreational sports activities are of a higher intensity.

Aerobic endurance is regarded as the most important component of motor fitness that is relevant for older adults to function independently.
In Chapter 6, the development in aerobic endurance after 18 months of participation in the GALM recreational sports program was assessed by means of changes in heart rate during fixed submaximal exercise. Since both groups were comparable regarding changes in energy expenditure for physical activity after 6 months and testing confirmed this, both groups were combined and considered as one group. A multilevel analyses with a model for change was developed. A significant decrease in heart rate over time was found at all walking speeds (4, 5, 6 and 7 km/h). The average decrease in heart rate was 5.5, 6.0, 10.0 and 9.0 beats/min for the 4, 5, 6 and 7 km/h walking speeds, respectively. The relative decrease varied from 5.1 to 7.4% relative to average heart rates at baseline. These results illustrate that participation in the GALM recreational sports program has a positive significant effect on aerobic endurance, and that the participants are able to perform at submaximal intensity more easily.

Based on the overall results it can be concluded that this study contributes to the field in how to effectively recruit sedentary and underactive older adults and stimulate them to become and stay active in recreational sports activities. As far as we know, this recruitment in combination with the recreational sport program is not only unique but also effective toward increasing performance-based fitness in the long term. Short-term effects were found in other leisure-time activities and health outcomes. To further stimulate other leisure-time and probably health outcomes besides the favorable effects that were already seen, additional interventions that pay more attention to behavioral change in terms of how to integrate other activities besides sports activities are recommended.