Background and intensity of the GALM physical activity program

Chapter 3

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Background
The Groningen Active Living Model (GALM) was developed to stimulate physical activity in sedentary and underactive older adults. The GALM physical activity program was primarily based on an evolutionary-biological play theory and insights from social cognitive theory. The purpose of this study was to assess the intensity of the GALM program.

Methods
Data from 15 GALM sessions were obtained by means of heart rate monitors.

Results
Data of 97 program participants (mean age: 60.1 y) were analyzed. The overall mean intensity for the GALM program was 73.7% of the predicted heart rate maximum and 6% of the monitored heart rate time could be classified as light, 33% as moderate and 61% as hard.

Conclusions
The GALM program met the intensity guidelines to increase cardiorespiratory fitness. The intensity and attractiveness of this physical activity program make it an interesting alternative for stimulating physical activity in sedentary and underactive older adults.
**Background and intensity of the GALM program**

**Introduction**

As in other western countries, the prevalence of physical inactivity among older adults constitutes a potential health burden for Dutch society.\(^1\)\(^3\) Although many community-based physical activity stimulation strategies have been conducted, only a few focus specifically on enhancing physical activity in sedentary and underactive older adults, a group that could benefit most from such strategies.\(^4\)\(^6\) To meet this need for more tailored approaches, a novel strategy termed the Groningen Active Living Model (GALM) was developed.

GALM is a behavioral change strategy for stimulating leisure-time physical activity participation in sedentary and underactive older adults 55 to 65 years of age. The strategy aims at stimulating and monitoring adults who are willing to participate (or resume participation) in leisure-time physical activity. The GALM strategy lasts 1.5 y and has been described in detail elsewhere.\(^7\)\(^8\) Part of the GALM strategy is the physical activity program which can be characterized as a leisure-time physical activity program with an emphasis on recreational sports activities (e.g. softball, dance, self-defense, swimming and athletics).\(^9\) The goal of the GALM program is to stimulate sedentary and underactive older adults to become and remain active in leisure-time physical activity once a week. We hypothesize that, by providing a versatile leisure-time physical activity program that is, on average, of moderate intensity, participants will gain or regain enjoyment during leisure-time physical activities and develop preferences towards certain activities. When the GALM program succeeds in its role as a ‘trigger’, it can cause a transfer in participants becoming physically active more frequently outside the GALM program.\(^10\)\(^11\) When this transfer occurs, former sedentary or underactive older adults might increase their frequency of moderate to vigorous physical activity and finally meeting the recommendations for enhancement of health and fitness.\(^12\)

To change the participants’ sedentary or underactive behavior, the attractiveness of the physical activity program was an important starting point of GALM. Many interventions have been set up to enhance physical activity among older adults and improve their health status and functional performance. Although scientific evidence shows that these interventions can indeed be successful in enhancing the health and fitness levels of the participants,\(^13\) persuading older adults to become and continue to be physically active remains a difficult task.
To assist the maintenance of physical activity in the GALM groups, it was assumed that interventions should be tailored to the individual’s wishes, preferences and needs.\textsuperscript{6,14-16} To this end, the versatile sport and leisure-time activities of the GALM program\textsuperscript{14,15} were based on the evolutionary-biological play theory\textsuperscript{17} and insights of social cognitive theory.\textsuperscript{18}

The evolutionary-biological play theory suggests that programs that are in accordance with the genetic potential of humans are most likely to succeed in developing a lifelong, physically active lifestyle. Therefore, this theory states that motor systems could be optimally developed and maintained if the motor qualities of strength, speed, endurance, flexibility and coordination were trained using motor actions such as walking, running, jumping, batting, throwing and catching that were integrated into games, sports and activities of daily living. This type of programs would also have to meet three conditions: a) safe environments would have to be created in which participants do not experience feelings of fear; b) the activities conducted should be slightly ambivalent, which means that exciting situations should be included without being too exciting; and c) curiosity should be stimulated or the desire to explore new activities.\textsuperscript{17} When these three conditions are met, a situation is created under which self-efficacy, social support and perceived fitness could be manipulated and ultimately lead to increased enjoyment in physical activity.\textsuperscript{7} In the GALM program, self-efficacy was developed by offering activities designed to provide successful mastery experiences. For example, the program had a low starting level with respect to the intensity and difficulty of the activities presented to participants, therefore making almost everyone feel at ease about their ability to participate. In addition, game rules and materials needed (e.g. balls) were adjusted to participants’ capabilities when necessary.\textsuperscript{7,18} Social support and social interaction were stimulated by support of other GALM group members, feedback from the instructor and the moment of social interaction that was planned at the end of each session. Finally, feelings of perceived fitness were influenced by letting the participants experience that they were capable of being physically active for longer periods of time at a higher intensity in the course of the GALM program.

Another reason for the versatility of the GALM program was that in this way the program also addressed several dimensions of motor fitness such as cardiorespiratory and muscular fitness as well as flexibility, all of which are crucial for older adults living independently.\textsuperscript{19,20}
To enhance health and fitness outcomes, physical activity interventions should meet a certain amount and quality level of exercise. According to the 1998 American College of Sports Medicine (ACSM) recommendations, exercise to increase cardiorespiratory fitness should be conducted 3 to 5 days per week with an intensity of 55 to 65% to 90% of maximum heart rate, or 40 to 50% to 85% of heart rate reserve, or maximum oxygen uptake with a duration of 20 to 60 min. The lower intensity values are most applicable to individuals who are quite unfit.\textsuperscript{12} The purpose of the present study was to investigate whether the GALM physical activity program, which was primarily based on an evolutionary-biological play theory and insights of social cognitive theory, was able to meet the physiological intensity guidelines to enhance cardiorespiratory fitness of sedentary or underactive older adults.

**Methods**

**Participants and procedures**
Subjects in three Dutch municipalities were included in this study. The three municipalities were selected based on the degree of urbanization. All participants had been recruited using the specific recruitment method of the GALM strategy,\textsuperscript{7,21} and started with the GALM program at the same time. The participants in this study were from five different GALM groups in three municipalities. A total of 4 to 6 different GALM sessions were monitored per municipality, resulting in data of all 15 sessions. During each of the 15 sessions, heart data was obtained of 5 to 10 randomly selected participants. Subjects who used medication that influenced heart rate (e.g. beta blockers) were excluded from participation. In this way, a total of 114 older adults were measured in the 6-month period the GALM sessions were conducted. Mean heart rate data will be presented per session. The main characteristics of the subjects were gathered and body fat was predicted using leg-to-leg bioelectrical impedance analysis (Tanita model TBF-300, Tokyo, Japan). This method proved to be reliable in measuring body fat percentage and results correlated highly with body fat percentages as measured with underwater weighing and dual energy X-ray absorptiometry.\textsuperscript{22} Before the measurements took place, each subject read and signed an informed consent approved by the Medical Ethical Board of Groningen University Hospital.
Heart rate monitoring
Heart rate monitoring of the participants was conducted and analyzed to assess the intensity of the GALM program. Heart rate monitoring has been commonly employed as an objective method of assessing intensity of physical activity. The use of heart rate as a measure of physical activity is promising because it is a physiological parameter known to have a strong positive association with energy expenditure during large-muscle dynamic exercise. Heart rate monitoring has been shown to be valid, and within-subject reproducibility to submaximal upper and lower body exercise is quite high (intraclass correlation coefficients 0.23 to 0.89 and 0.91 to 0.95, respectively).

The net time we monitored heart rate of the participants ranged from 54 to 60 min per session, which had a maximum duration of 60 min. A 15-s interval period was used for the heart rate recording and the data were obtained by means of Polar heart rate monitoring devices (Accurex and Vantage models, Polar Electro, Tampere, Finland). The data were transferred from the Polar receiver to a computer by means of an interface for further analysis.

Structure of the GALM program
The GALM program consisted of 15 sixty-min sessions, at a frequency of once a week. The selected leisure-time sport activities of the GALM program were based on national survey results on preferences of older adults towards certain leisure-time sport activities. The favorite leisure-time sport activities were incorporated into the GALM program (Table 1).

Each GALM session was structured as follows: a) a warming-up period of 5 to 10 min in which activities such as walking, exercise-to-music routines and introductory activities were linked to exercises to be conducted later in the session; b) 20 to 25 min of skills practice in which the offered exercises were tailored to the level and needs of the participants, and, if necessary, adapted materials were used (e.g. foam balls); c) 20 to 25 min of playing in which the learned and practiced skills were used in the context of a game or other activities; d) 5 to 10 min of cooling-down consisting of flexibility and relaxation activities. After each session, a 15-min moment of socializing was incorporated in order to strengthen the social interaction and cohesion of the group. During this brief period, the instructor evaluated the session with the participants and gave answers to specific questions and the participants were able to engage in informal conversations with each other while having
<table>
<thead>
<tr>
<th>Session</th>
<th>Recreational sports activities</th>
<th>Examples of exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introductory/ball game</td>
<td>Introduction of instructor, participants and GALM program. Warming-up with walking, running exercises in small groups to learn each other’s names. Ball-throwing and catching, playing introductory game of softball.</td>
</tr>
<tr>
<td>2</td>
<td>Softball</td>
<td>Warming-up on music, rhythmical walking, running, arm swinging and jump exercises. Ball-throwing and catching combined with running and batting with small groups. Playing adapted form of indoor softball.</td>
</tr>
<tr>
<td>3</td>
<td>Dance</td>
<td>Warming-up on music with increased intensity like arm and leg swings. Learning some steps and moves (e.g., V-step, side-step, step-tap) followed by more intensified exercises like jumping, tripling, skipping, muscle-strengthening exercises for abdomen, buttock and legs, ending with stretching.</td>
</tr>
<tr>
<td>4</td>
<td>Volleyball</td>
<td>Warming-up individually throwing and catching volleyball or foam ball, pair-wise exercises. Playing mini-volleyball with adjusted rules.</td>
</tr>
<tr>
<td>5</td>
<td>Self-defense</td>
<td>Warming-up on music, exercises with wooden stick like swinging, jumping, balancing the stick on fingers, pulling and pushing, stick wrestling, defense and attack combinations (cautiously).</td>
</tr>
<tr>
<td>6</td>
<td>Badminton</td>
<td>Warming-up on music, low-impact exercises and stretching. Teaching badminton skills and playing badminton with partner of same level.</td>
</tr>
<tr>
<td>7</td>
<td>Basketball</td>
<td>Warming-up with a basketball dribbling and scoring on basket. Circuit of basketball exercises (set shot, lay-up, chest pass) and playing mini-basketball.</td>
</tr>
<tr>
<td>8</td>
<td>Swimming</td>
<td>Aqua jogging, wet-ball exercises and swimming.</td>
</tr>
<tr>
<td>9</td>
<td>Soccer</td>
<td>Warming-up exercises with ball, dribbling, Soccer circuit with shooting, dribbling and passing. Playing mini-soccer with special rules.</td>
</tr>
<tr>
<td>10</td>
<td>Indoor hockey</td>
<td>Warming-up by means of simple hockey skills, pushing and stopping the ball, playing mini-hockey (adapted rules and materials, e.g., longer hockey sticks, lighter/soft ball).</td>
</tr>
<tr>
<td>11</td>
<td>Games circuit</td>
<td>Warming-up on music, introduction of game skills. Playing the circuit with exercises like throwing, catching, walking, running, kicking, jumping.</td>
</tr>
<tr>
<td>13</td>
<td>Tennis</td>
<td>Warming-up on music doing dynamic flexibility exercises like swinging of arms and legs, walking/running and throwing/catching tennis ball with partner. Tennis skills individually like bouncing on racket, with walking with tennis ball/foam ball/balloon. Playing tennis with adjusted rules.</td>
</tr>
<tr>
<td>14</td>
<td>Korfball&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Warming-up with ball together with partner throwing, catching during walking and running. Scoring on a basket. Playing an adapted form of mini korfball.</td>
</tr>
<tr>
<td>15</td>
<td>Athletics</td>
<td>Warming-up with walking, running, stretching and dynamic flexibility exercises. Interval running, javelin throwing/tennis ball. Aiming and throwing javelin/ball on targets (e.g., balloons). Team relay running.</td>
</tr>
</tbody>
</table>

<sup>a</sup> Korfball is a traditional mixed-team ball game that aims at scoring on the basket of the opposite team that is positioned on a pole about 11 ft high. The ball has to be played by hand and no physical contact is allowed.
a drink. All the sessions were conducted in groups consisting of 15 to 24 participants. The sessions were led by a trained instructor who, besides being a professional sports educator, had to complete a three-day course to learn how to teach the GALM sessions.

The GALM program was conducted at a local gymnasium in or near the neighborhoods in which the participants lived. By means of this neighborhood-oriented approach, GALM tried to make use of participants’ social networks. Another bonus of this approach is that participants often lived within walking or cycling distance of the gymnasium, which lowers a barrier for participation.

**Statistical analysis**

All data were analyzed with SPSS version 10.0 (SPSS, Inc., Chicago, IL). The first screening for abnormalities in the heart rate curves showed that data of 17 participants (15%) were too damaged; these files were excluded from further analysis. Criterion for exclusion was more than 10 consecutive missing or unusable heart rates. Finally, heart rate data for 97 older adults were eligible for analysis in this study.

Descriptive statistics were used to analyze the main characteristics of the subject and the heart rate data. The heart rate data were categorized as light, moderate or hard according to the ACSM 1998 classification, which was based on the percentage of maximum heart rate (HRmax). The HRmax was predicted by the formula HRmax = 220 - age (in y). The ‘light’ category was defined as ≤ 54% of HRmax, ‘moderate’ was 55 to 69% of HRmax and ‘hard’ was ≥ 70% of HRmax.

**Results**

The 97 study participants (47% men and 53% women) had a mean age of 60.1 y (SD = 3.7). The main characteristics of the study sample are shown in Table 2.

Results of the heart rate monitoring show an overall mean heart rate for the introductory program of 117.8 beats/min (SD = 8.2). Heart rates varied between a minimum mean of 103.3 beats/min (SD = 8.3) for the fitness session and a maximum mean of 132.9 beats/min (SD = 11.8) for the korfball session. Overall mean percentage of HRmax was 73.7% (SD = 5.1). Mean percentages of HRmax varied as low as 64.6% (SD = 5.2) for fitness to as high as 83.1% (SD = 7.4) for korfball (Table 3).
Background and intensity of the GALM program

Table 2. Main characteristics of the study sample by sex and for the total sample.

<table>
<thead>
<tr>
<th>Main characteristics</th>
<th>Men (n = 46)</th>
<th>Women (n = 51)</th>
<th>Total (N = 97)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Age (y)</td>
<td>61.0</td>
<td>3.9</td>
<td>59.4</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>83.9</td>
<td>11.6</td>
<td>74.4</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>176</td>
<td>5.8</td>
<td>165</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>27.0</td>
<td>3.6</td>
<td>27.3</td>
</tr>
<tr>
<td>Body fat (%)</td>
<td>25.6</td>
<td>4.9</td>
<td>38.1</td>
</tr>
</tbody>
</table>

For the overall GALM program, 6% (SD = 5) of monitored heart rate time could be classified as light, 33% (SD = 13) as moderate and 61% (SD = 16) as hard. The korfball session had the highest mean percentage (88%, SD = 16) of time spent in the ‘hard’ category. The badminton session showed the highest mean percentage (21%, SD = 30) of time in the ‘light’ category.

DISCUSSION

This article describes the background and results of a study to evaluate the intensity of GALM, a versatile physical activity program that is primarily based on an evolutionary-biological play theory and insights of social cognitive theory.

The mean age of participants (60.1 y, SD = 3.7) and the proportion of men (47%) and women (53%) in this study demonstrated that the study sample was a reasonably representative cross section of the GALM participants in general. Furthermore, for purposes of representativeness, five different GALM groups with five different GALM instructors were monitored to assess the intensity of the GALM program. In this way, our measures were not unduly influenced by the personal teaching style of an individual instructor. A disadvantage of having monitored sessions led by five different instructors was the standardization of the GALM program, which could limit the generalizability of the study results. To minimize this variability between GALM sessions and instructors, the described structure and leisure-time sport activity scheme (Table 1) had to be adhered to strictly and all instructors completed a 3-d GALM training course.
Table 3. Recreational sports activity, mean heart rate, percentages of monitored heart rate time classified according to the categories light, moderate and hard,\textsuperscript{12} and percentage of predicted HRmax of the 15 GALM sessions.

<table>
<thead>
<tr>
<th>Recreational sports activity</th>
<th>Mean HR (SD)</th>
<th>% HR\textsubscript{max} (SD)</th>
<th>Light (SD)</th>
<th>Moderate (SD)</th>
<th>Hard (SD)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Introductory/ball game</td>
<td>114.3 (11.9)</td>
<td>71.5 (7.4)</td>
<td>10 (11)</td>
<td>36 (34)</td>
<td>54 (42)</td>
<td>4</td>
</tr>
<tr>
<td>2 Softball</td>
<td>120.3 (8.7)</td>
<td>75.2 (5.4)</td>
<td>1 (1)</td>
<td>36 (33)</td>
<td>63 (34)</td>
<td>4</td>
</tr>
<tr>
<td>3 Dance</td>
<td>128.0 (9.4)</td>
<td>80.0 (5.9)</td>
<td>1 (1)</td>
<td>17 (17)</td>
<td>82 (17)</td>
<td>5</td>
</tr>
<tr>
<td>4 Volleyball</td>
<td>121.5 (8.7)</td>
<td>76.0 (5.4)</td>
<td>1 (2)</td>
<td>30 (33)</td>
<td>69 (34)</td>
<td>9</td>
</tr>
<tr>
<td>5 Self-defense</td>
<td>118.9 (9.0)</td>
<td>74.4 (5.6)</td>
<td>4 (5)</td>
<td>38 (31)</td>
<td>58 (34)</td>
<td>8</td>
</tr>
<tr>
<td>6 Badminton</td>
<td>104.0 (10.5)</td>
<td>65.0 (6.6)</td>
<td>21 (30)</td>
<td>40 (26)</td>
<td>39 (36)</td>
<td>8</td>
</tr>
<tr>
<td>7 Basketball</td>
<td>121.6 (10.2)</td>
<td>76.1 (6.4)</td>
<td>5 (10)</td>
<td>22 (21)</td>
<td>73 (30)</td>
<td>6</td>
</tr>
<tr>
<td>8 Swimming</td>
<td>111.6 (8.2)</td>
<td>69.8 (5.1)</td>
<td>6 (12)</td>
<td>47 (25)</td>
<td>47 (32)</td>
<td>6</td>
</tr>
<tr>
<td>9 Soccer</td>
<td>119.6 (13.2)</td>
<td>74.8 (8.2)</td>
<td>3 (2)</td>
<td>31 (15)</td>
<td>66 (17)</td>
<td>9</td>
</tr>
<tr>
<td>10 Indoor hockey</td>
<td>116.0 (10.5)</td>
<td>72.5 (6.6)</td>
<td>7 (8)</td>
<td>37 (28)</td>
<td>56 (34)</td>
<td>8</td>
</tr>
<tr>
<td>11 Games circuit</td>
<td>126.6 (9.6)</td>
<td>79.2 (6.0)</td>
<td>2 (1)</td>
<td>20 (19)</td>
<td>78 (20)</td>
<td>9</td>
</tr>
<tr>
<td>12 Fitness</td>
<td>103.3 (8.3)</td>
<td>64.6 (5.2)</td>
<td>8 (9)</td>
<td>66 (12)</td>
<td>26 (16)</td>
<td>4</td>
</tr>
<tr>
<td>13 Tennis</td>
<td>116.1 (12.0)</td>
<td>72.6 (7.5)</td>
<td>5 (4)</td>
<td>39 (25)</td>
<td>56 (27)</td>
<td>8</td>
</tr>
<tr>
<td>14 Korfball</td>
<td>132.9 (11.8)</td>
<td>83.1 (7.4)</td>
<td>1 (1)</td>
<td>11 (15)</td>
<td>88 (16)</td>
<td>8</td>
</tr>
<tr>
<td>15 Athletics</td>
<td>117.6 (7.4)</td>
<td>73.5 (4.6)</td>
<td>9 (14)</td>
<td>25 (20)</td>
<td>66 (30)</td>
<td>6</td>
</tr>
<tr>
<td>Overall mean HR</td>
<td>118.1 (8.0)</td>
<td>73.9 (5.0)</td>
<td>6 (5)</td>
<td>33 (13)</td>
<td>61 (16)</td>
<td></td>
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</tbody>
</table>

SD, standard deviation.
Mean HR, mean heart rate.
% HR\textsubscript{max}, percentage of predicted heart rate maximum.
Light, \(\leq54\%\) of HR\textsubscript{max}.\textsuperscript{12}
Moderate, 55 to 69\% of HR\textsubscript{max}.\textsuperscript{12}
Hard, \(\geq70\) of HR\textsubscript{max}.\textsuperscript{12}
The main characteristics of the subjects, together with the standardization procedures used, increased the likelihood of our results providing a realistic indication of the intensity of the GALM physical activity program despite our study group being only a small sample of all Dutch GALM participants.

In our study, 17 heart rate files (15%) were excluded from analysis because of abnormalities in or missing heart rate data. In one of the few studies that report on failures in heart rate assessment in a field setting, Treiber et al.\textsuperscript{25} reported that less than 1.2% of the registrations with the Sport heart rate tester were lost because of malfunction. In that study, children were engaged in six 3-min activities: standing, walking, jogging, throwing, batting and playing in a jungle gym. Electrode detachments resulting from sweating and body movement were cited as reasons for malfunction. A possible explanation for the higher percentage of nonrepairable heart rate files in our study could be the fact that we monitored older people, who are generally more obese than younger people and could have disturbed the transmission of heart rate signals because of subcutaneous fat. Secondly, we monitored for longer periods of time (54-60 min per session). Finally, the activities conducted in our study showed a much greater variety of bodily movement, which in turn could increase the risk of unintentional detachment of the transmitters attached to the participants’ chests. The highest percentages of nonrepairable files were reported during the fitness session, the introductory/ball game and the dance session.

The overall mean intensity of the GALM program was 73.7% (SD = 5.1) of HRmax with a variation between 64.6% (SD = 5.2) and 83.1% (SD = 7.4) of the HRmax. From the relationship found between HRmax and % VO\textsubscript{2max} it can be concluded that the overall mean intensity of the GALM program was about 60% of VO\textsubscript{2max} or heart rate reserve with a variation between 50% and about 72% of VO\textsubscript{2max}.\textsuperscript{31,32} In the present study, however, the age-predicted HRmax equation, HRmax = 220-age (in y) was used as the basis for describing the intensity of the GALM program. Tanaka, Monahan, and Seals\textsuperscript{33} argue that this equation was never validated in studies that included sufficient numbers of older adults. They conclude that the traditionally used equation underestimates HRmax in older adults, and that this would cause an underestimation of the appropriate intensity of prescribed exercise programs. Robergs and Landwehr\textsuperscript{34} also emphasize that currently there is no acceptable method to estimate HRmax and that there is no scientific merit to using the rule 220-age formula.
If HRmax needs to be estimated, however, the most accurate equation is that of Inbar et al.: \( \text{HRmax} = 205.8 - 0.685 \times \text{age} \) \( (S_{xy} = 6.4 \text{ beats/min}) \). In the context of the debate on the 220-age formula, we conclude that the intensity of the GALM physical activity program is probably overestimated in this study. With this in mind, we still conclude that the overall mean intensity of the GALM program could be best classified as moderately intense (55 to 69% of HRmax).

The classification of the heart rate data into light, moderate and hard intensity was based on the ACSM 1998 guidelines for developing and maintaining cardiorespiratory fitness in healthy adults. The results show that, most of the time, participants were physically active in the moderate (33%, SD = 13) or hard (61%, SD = 16) intensity zone. Still, considerable standard deviations are reported, indicating major interpersonal differences from which it can be concluded that the intensity of the sessions varied greatly between individuals. Another consideration is the small number of participants that were measured per session ranging from 4 to 9. This variability together with the number of cases per session makes it difficult to draw hard conclusions on the intensity of the program as assessed in this study. Although the results appear promising with respect to the intensity of the GALM program, more and better-controlled studies should be conducted to gather more information on the intensity of versatile physical activity programs like GALM.

A disadvantage of our study was that the measurements took place in a time period of 6 months. This meant that GALM participants who were monitored during the first sessions of the GALM program could be indeed considered sedentary or underactive. By contrast, the participants measured in the last GALM sessions had already been physically active in the GALM program for several months. One could argue that this may have led to an underestimation of the assessed intensity results of the latter GALM sessions as a consequence of a probable heart rate-lowering training response. However, the lowering of heart rate during submaximal exercise was only reported as an effect of prolonged participation in aerobic exercise training. Therefore, we think the difference in the amount of GALM sessions participated in at the time of heart rate monitoring did not affect the study results.

In sum, this study provides information on the background and structure of the GALM program. The results of the intensity study are an indication that an attractive versatile physical activity program like the GALM program is able to meet the intensity criteria set by the ACSM.
In the context of health promotion this can be considered as an encouragement, given the fact that programs offering different physical activity options may be particularly appealing to older adults.\textsuperscript{14,15}
References

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