Development and evaluation of a community-based approach to promote health-related behaviour among older adults in a socioeconomically disadvantaged community
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Reach and effectiveness of a community-based intervention on physical activity and healthy eating of older adults in a socioeconomically disadvantaged community

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Abstract

Objective: The aim of this study is to assess the reach and effectiveness of a community-based intervention designed to promote physical activity and healthy eating among older adults in a socioeconomically disadvantaged community in the Netherlands.

Methods: The intervention was evaluated with a controlled pre- and post-test quasi-experimental study design, with 430 randomly selected older adults participating in the intervention group and 213 in a control group at baseline. The intervention included a local media campaign and environmental approaches (e.g., community involvement) and was implemented during a three-month high-intensity period, followed by a six-month low-intensity one. Levels of physical activity and fruit and vegetable consumption were assessed at baseline and at three and nine months after baseline.

Results: At the follow-up measurements, the intervention had reached 68 and 69% of the participants in the intervention group, respectively. No significant differences were found between the intervention group and the control group in changes regarding any outcome except for transport-related physical activity at three and nine months follow-up.

Conclusions: The systematically developed community-based intervention reached a relatively large proportion of the participants, but had only small effects on the levels of physical activity and healthy eating in older adults in the short and medium term.
Introduction

Physical inactivity and unhealthy eating are major contributors to overweight or obesity, cardiovascular diseases, diabetes type 2 and other chronic diseases.\textsuperscript{1} Older adults and those with a low socioeconomic status (SES) in particular have unhealthier lifestyles than others.\textsuperscript{2,3} Promoting a physically active lifestyle and a healthy diet will not only prevent chronic diseases but may also result in prolonged participation in social activities, improved health, and a better quality of life.\textsuperscript{4}

To improve health-related behaviour in the population, psychosocial and cultural changes which can be offered using community-based approaches are required.\textsuperscript{5} These are considered to be more effective than individual approaches in hard-to-reach groups with low motivation or facing other barriers, such as limited financial resources.\textsuperscript{6,7} Community-based approaches are promising, feasible and cost-effective for initiating and sustaining changes in health-related behaviour of people who are hard to reach.\textsuperscript{8} Theoretically well-founded multi-component interventions seem to be most effective in increasing physical activity in socioeconomically disadvantaged communities.\textsuperscript{9}

Community-based interventions which aim to improve physical activity and healthy eating have been proven effective in general populations. However, those interventions do not target specifically older adults in socioeconomically disadvantaged communities. Knowledge is lacking regarding the effectiveness of community-based interventions in this specific target population with the aim to improve physical activity and healthy eating. Therefore, we developed a community-based intervention using Intervention Mapping based on evidence- and practice-based input tailored to the target population.\textsuperscript{10}

The aim of this paper is to assess the reach and the short- and medium-term effects of this intervention on physical activity and healthy eating in older adults in a socioeconomically disadvantaged community from Eastern Groningen in the Netherlands compared to a control group. This region is characterised by a high percentage of older adults of low SES with a high prevalence of chronic diseases.

Methods

Study design
The study included a controlled pre- and post-test quasi-experimental design, with baseline (T0) data collection in December 2011 to January 2012 and two follow-ups at three (T1) and nine months (T2) after baseline. The intervention community lived in the town of Veendam and the control community consisted of part of the municipality of Stadskanaal. Both
Chapter 4

Communities are located in Eastern Groningen, a mainly rural area in the northeastern part of the Netherlands, in which relatively many older adults and people with low SES live compared to other regions in the Netherlands.

Participants and recruitment
The intervention target population included residents aged 55 years and older who were randomly selected from the population registers of the two municipalities. Older adults dependent on homecare due to health problems were excluded, because in this study we focused on relatively healthy older adults who were willing and able to participate in the study by filling in questionnaires. The older adults selected were invited for the study by letter which set out the study purpose, content and procedure. Participants were explicitly informed about their rights and gave their consent to participate in the study by completing and returning the enclosed questionnaire. To further safeguard the rights of the human subjects, all members of the research team were carefully instructed to answer participants’ questions concerning the study and their individual rights, and to respect these rights. After two weeks, non-responders received a reminder by post. At three and nine months after baseline measurement, all the participants who completed the baseline measurement received a further questionnaire by post. To promote the response respondents received a reward for filling in the questionnaires: vouchers worth ten euros each for a bouquet of flowers at a local florist’s the first time and for a basket of fruit at a local greengrocer’s the second time. At baseline, 643 older adults participated, 430 in the intervention and 213 in the control group. Of these, 569 and 564 participated in the first and second follow-up, respectively (Figure 1). Retention at follow-up was nearly 90% for both groups.

Intervention
We developed the community-based intervention as a part of ‘Goud Leven’ (GL), in English: Groningen Lifestyle Intervention for Seniors (GLIS), the details of which are reported elsewhere (unpublished observations; Luten KA, Dijkstra A, de Winter AF, Reijneveld SA). “Goud” has a dual meaning: it means “good” in the local dialect of Groningen and simultaneously “gold” in standard Dutch. “Leven” is Dutch for “life” or “living”. The Intervention Mapping (IM) protocol was used to develop the intervention. Within the IM we used the Integrated Model for Change (I-Change Model)\(^1\) and the Analysis Grid for Elements linked to Obesity (ANGELO) framework\(^1\) to provide a broad perspective on behavioural change that regards psychological as well as environmental determinants. Stakeholders (e.g., professionals and older adults) were involved in the development and implementation of the intervention, which included a local media campaign and environmental approaches. The implementation included various strategies at different levels of the ecological model,\(^1\) through local channels if possible. The intervention was delivered during a high-intensity period of three months followed by a low-intensity period
of six months. All the strategies were executed in the first three months. During the following low-intensity period most of the strategies were repeated, but less frequently. The intervention consisted of the following components:

**Posters.** Seven different posters displayed a photo of a peer of the intervention group and a slogan stating a reason for being physically active or eating healthily. A total 244 posters were displayed in public places around the intervention community of Veendam, such as municipality offices, the social services office, the social welfare office, the library, community centres, shopping centres, and at healthcare locations such as general medical practices, physiotherapy practices, dietician practices, home healthcare centres, and at sports centres.

**Radio spots.** Seven radio spots were developed in which role models from the local community explained the reasons for their health-related behaviour in greater detail. The radio spots were broadcasted a total of 600 times by a local radio station in Veendam at different intervals during the day.

**Radio interviews.** A total of twelve weekly interviews with peers and healthcare professionals were broadcasted during a programme on the local radio station. The interviewees reported in greater detail what they do to obtain or maintain a healthy lifestyle or how they encourage a healthier lifestyle among their patients or clients.

**Advertorials and press reports.** Four advertorials concerning aspects of a healthy lifestyle and three press reports about the project and its progress were published in two local newspapers.

**Newsletters.** Three newsletters were developed, one for older adults and two for healthcare professionals. The newsletters included news concerning the project and upcoming local activities. The newsletter for professionals was completed with information to advise or support their clients or patients to live healthier lifestyles.

**Flyers.** Six different flyers about upcoming activities were developed and distributed in the local community of Veendam.

**GLIS guide.** A total of 5622 GLIS guides were distributed to all households including at least one person aged 55 years or older. A further 230 guides were handed out by local healthcare professionals. The guides consisted of information on local activities, suggestions to increase the level of physical activity or improve healthy eating, healthy recipes and the addresses of local healthcare professionals able to provide advice or support for a healthier lifestyle.

**GLIS website.** The GLIS website ([www.goudleven.nl](http://www.goudleven.nl)) contained an updated overview of local activities for older adults, suggestions for a healthier lifestyle and information about the project. The website’s address was on all printed campaign materials distributed in the intervention region. The website was freely accessible.
Environmental approaches. Local peers and healthcare professionals were involved in developing, distributing and promoting the materials and messages of the local media campaign. Furthermore, different meetings and events were organised, such as a market providing information about local activities and allowing inhabitants to try out these activities. The materials and messages about the intervention were also promoted at local holiday markets and at local events.

None of the above elements of the local media campaign or the environmental approach were applied in the control region.
Measures and procedure

Baseline and follow-up measurements at three and nine months after baseline were conducted using a postal self-report questionnaire. At baseline, sociodemographic factors and health-related behaviours, i.e., physical activity and healthy eating, were measured. The same variables were assessed at both follow-up measurements as at baseline, complemented with items concerning reach, i.e., exposure to the intervention.

Sociodemographic factors concerned gender, age, and socioeconomic status (SES). SES was measured as educational level, distinguished into two categories: 1) no education, primary education or primary lower professional education (low); 2) intermediate general or intermediate professional education, higher general or higher professional education, and university (higher).

Physical activity was assessed using the Short QUestionnaire to ASsess Health-enhancing physical activity (SQUASH), a reliable and validated Dutch questionnaire to measure physical activity among adult populations. The questionnaire includes four physical activity domains: transport-related, work-related, household-related, and leisure-time physical activity. Based on the data from the SQUASH, we computed the hours a week of physical activity overall and as minutes a day for three separate physical activity domains: transport-related, household-related, and leisure-time physical activity. Because a part of the population had retired from work, the work-related physical activity domain was not included. The maximum total physical activity and for each physical activity domain was limited to sixteen hours a day. Participants with higher scores on these items were not included in the analyses.

Healthy eating was operationalised as fruit and vegetable consumption. To assess fruit consumption, participants were asked about how many days a week they consumed fruit or fruit juice and how much they consumed. For vegetable consumption, respondents had to specify how many days a week they ate cooked vegetables, raw vegetables or salads and how many servings they consumed. The total amount of fruit and vegetable consumption was operationalised as grams a day.

Reach was assessed by asking participants in the intervention group ‘Have you heard of or seen specific elements of Goud Leven?’, using fifteen self-report items listing all intervention elements at both follow-up measurements. At T1 and at T2, participants were classified as ‘reached’ if they had heard or seen one or more of these elements. Participants in the control group were asked on a single item if they had heard of or seen elements of Goud Leven. If participants reported at T1 to not have heard of or seen elements of the intervention, they were classified as T1 ‘not reached’. T2 ‘not reached’ was assessed in the same way.
Chapter 4

Statistical analyses

We compared the general characteristics of the participants in the intervention and control groups at baseline. Furthermore, we examined whether older adults who participated at follow-up assessments differed from participants who dropped out during the study. Possible differences were tested using chi-square tests and independent-sample t-tests.

Subsequently, we evaluated the effects of the intervention compared to the control condition on six behaviours - total, transport-related, household-related, and leisure-time related physical activity, fruit consumption, and vegetable consumption - after three and after nine months. For each of the two follow-up measurements, six analyses of covariance (ANCOVAs) were conducted with community (Veendam/Stadskanaal) as the between-subjects factor, the follow-up measurement of one of the six behaviours as dependent variable, and the corresponding baseline measurement of the particular behaviour as covariate. These analyses show whether the changes in behaviours between baseline and follow-up measurement differ with statistical significance between both conditions. Because the baseline measure of the dependent variable was controlled for, this analysis assesses potential “condition differences in changes in the outcome variable”.

To further increase insight into the changes in behaviour, repeated measures t-tests were performed within the conditions. These analyses show whether within each condition the changes in behaviour from baseline to follow-up are significant. These analyses were conducted in all participants and repeated for only those participants who were really exposed to the intervention concerned. They thus comprised only participants who were reached in the intervention group, and only participants who were not reached in the control group. Statistical tests were considered to be significant when p<0.05. All the data were analysed using SPSS 20.0 for Windows.

Results

Participant characteristics

The baseline characteristics of the participants by condition are presented in Table 1. The intervention and control samples were comparable on almost all baseline characteristics except on SES: participants of low SES were more prevalent in the control community. No significant differences between the study participants and drop-outs were observed in either group at T1. At T2, more participants with a low SES (p=0.04) remained in the control group, whereas participants with a higher SES more frequently dropped-out in the control group.
Reach and effectiveness of the intervention

In the intervention community, 68 and 69% of the participants were reached by the intervention at the first and the second follow-up, respectively, compared to 16 and 22% in the control community. The most commonly mentioned sources of information about the intervention project were the local newspaper, local radio, poster and the GLIS guide. A total of 38% of the participants in the intervention group reached by the intervention were of low SES (i.e., primary lower professional education as highest educational level), which is comparable to the total intervention sample.

Table 2 shows the short-term effects (T1) of the intervention on physical activity and fruit and vegetable consumption. The intervention group demonstrated a significantly smaller decrease with respect to transport-related physical activity compared to the control group. Regarding leisure-time physical activity, a significantly smaller increase was observed in the intervention group compared to the control group. The results showed no significant differences in changes in total physical activity, household-related physical activity and fruit and vegetable consumption in the intervention group compared to the control group. The only significant increases within the intervention group were demonstrated for vegetable consumption, while the control group showed significant increases in leisure-time physical activity and fruit and vegetable consumption.

The medium-term effects (T2) of the intervention on physical activity and fruit and vegetable consumption are shown in Table 3. The results at T2 demonstrated a significant increase in transport-related physical activity in the intervention group compared to the control group. No significant changes were found for total, household-related, and leisure-time physical activity, and fruit consumption in the intervention group compared to the control group.

Table 1. Baseline characteristics of the participants

<table>
<thead>
<tr>
<th></th>
<th>Intervention n=430</th>
<th>Control n=213</th>
<th>t/X²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (% male)</td>
<td>39.5</td>
<td>43.7</td>
<td>1.00</td>
<td>0.32</td>
</tr>
<tr>
<td>Age (mean (SD) in years)</td>
<td>66.2 (7.8)</td>
<td>67.0 (7.8)</td>
<td>-1.28</td>
<td>0.20</td>
</tr>
<tr>
<td>SES (% low)a</td>
<td>38.7</td>
<td>58.6</td>
<td>22.4</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Physical activity (% meeting guidelines)b</td>
<td>66.8</td>
<td>60.6</td>
<td>2.32</td>
<td>0.13</td>
</tr>
<tr>
<td>Fruit consumption (% meeting guidelines)b</td>
<td>57.2</td>
<td>54.3</td>
<td>0.45</td>
<td>0.50</td>
</tr>
<tr>
<td>Vegetable consumption (% meeting guidelines)b</td>
<td>25.1</td>
<td>20.1</td>
<td>1.68</td>
<td>0.20</td>
</tr>
</tbody>
</table>

SD: standard deviation; SES: socioeconomic status; a n missing ranged from 1 to 9 (in total); b n missing ranged from 27 to 92 (in total); * p<0.05
Table 2. Mean physical activity and fruit and vegetable consumption at baseline (T0) and 3 months follow-up (T1), and results of the statistical tests

<table>
<thead>
<tr>
<th></th>
<th>Intervention group</th>
<th></th>
<th>Control group</th>
<th></th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Baseline T0 Mean (SD)</td>
<td>Follow-up T1 Mean (SD)</td>
<td>Change</td>
<td>N</td>
</tr>
<tr>
<td>Total PA</td>
<td>358</td>
<td>1691 (1306)</td>
<td>1738 (1227)</td>
<td>47</td>
<td>166</td>
</tr>
<tr>
<td>Transport-related PA</td>
<td>364</td>
<td>168 (264)</td>
<td>162 (290)</td>
<td>-6</td>
<td>174</td>
</tr>
<tr>
<td>Household-related PA</td>
<td>364</td>
<td>626 (752)</td>
<td>587 (617)</td>
<td>-39</td>
<td>173</td>
</tr>
<tr>
<td>Leisure-time PA</td>
<td>364</td>
<td>564 (733)</td>
<td>576 (629)</td>
<td>12</td>
<td>173</td>
</tr>
<tr>
<td>Fruit consumption</td>
<td>326</td>
<td>213 (150)</td>
<td>214 (172)</td>
<td>1</td>
<td>166</td>
</tr>
<tr>
<td>Vegetable consumption</td>
<td>250</td>
<td>159 (83)</td>
<td>176 (86)</td>
<td>17 **</td>
<td>138</td>
</tr>
</tbody>
</table>

N: sample size; PA: physical activity in minutes/week; Fruit consumption in grams/day; Vegetable consumption in grams/day; SD: standard deviation; * Level of significance from Repeated measures t-tests; ** Partial eta squared; level of significance from ANCOVA’s; * p<0.05; ** p<0.01; *** p<0.001
Table 3. Mean physical activity and fruit and vegetable consumption at baseline (T0) and 9 months follow-up (T2), and results of the statistical tests

<table>
<thead>
<tr>
<th></th>
<th>Intervention group</th>
<th>Control group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Total PA</td>
<td>355</td>
<td>1635 (1261)</td>
<td>1771 (1288)</td>
</tr>
<tr>
<td>Transport-related PA</td>
<td>363</td>
<td>166 (257)</td>
<td>219 (402)</td>
</tr>
<tr>
<td>Household-related PA</td>
<td>363</td>
<td>624 (711)</td>
<td>666 (702)</td>
</tr>
<tr>
<td>Leisure-time PA</td>
<td>363</td>
<td>536 (578)</td>
<td>546 (561)</td>
</tr>
<tr>
<td>Fruit consumption</td>
<td>329</td>
<td>204 (144)</td>
<td>215 (154)</td>
</tr>
<tr>
<td>Vegetable consumption</td>
<td>268</td>
<td>159 (84)</td>
<td>174 (83)</td>
</tr>
</tbody>
</table>

N: sample size, PA: physical activity in minutes/week; Fruit consumption in grams/day; Vegetable consumption in grams/day; SD: standard deviation; * Level of significance from Repeated measures t-tests; ** Partial eta squared; level of significance from ANCOVA’s; * p<0.05; ** p<0.01; *** p<0.001
The only significant increases within the intervention group were demonstrated for transport-related physical activity and vegetable consumption. The control group showed significant increases in total physical activity and fruit and vegetable consumption.

We repeated the analyses restricted to reach, finding comparable significant results with effect sizes of 0.35 for transport-related physical activity and -0.15 for leisure-time physical activity at T1, and 0.45 for transport-related physical activity at T2. This suggests medium to large effect sizes for transport-related physical activity at T1 and T2.

Discussion

In this quasi-experimental study we describe the reach and effectiveness of the community-based intervention on physical activity and healthy eating among older adults in a socioeconomically disadvantaged community from Eastern Groningen in the Netherlands. We reached a relatively large proportion of the participants with our intervention but found that the intervention had only minor effects.

Our study demonstrated that a rather large number of older adults in a socioeconomically disadvantaged community were reached. These results are in line with previous community-based interventions in non-disadvantaged communities in which 63% and 95% of the adults in their respective intervention groups were reached.\textsuperscript{15,16} The high reach of 95% can be explained by the greater emphasis on social marketing in that study, including TV reports.\textsuperscript{16} Taking into account our study sample’s characteristics and the intervention’s limited duration, the relatively high reach among older adults with low SES is promising. The particularly promising aspects of our approach include the involvement of the local community, the use of locally-orientated media channels, and the special attention paid to tailoring the intervention to the target population (e.g., posters of local peers and radio spots which were partly spoken in the local dialect).

Our community-based intervention yielded only minor effects on physical activity and healthy eating in the short and medium term. Some other studies found changes in physical activity or dietary fat intake through community-based approaches, but these were only found after a high-intensity intervention period of at least one year.\textsuperscript{15-19} We hypothesise that the intervention would have been more effective if its high-intensity period had been extended as behavioural change of individuals is quite difficult and requiring social and cultural changes which take years. Moreover, economic factors or certain health beliefs might be barriers to behavioural change in this population. Therefore, we developed the intervention in co-creation with the community to maximise its focus on psychological and environmental determinants including social influence by peers. Another explanation is that the implementation of the social support by local peers and professionals may have been insufficient to result in changes in the behaviour of older adults, and
therefore reduced the contrast between the intervention and control groups. It has been suggested that such support increases intervention effectiveness.\textsuperscript{9,20}

In addition, methodological factors may have affected our findings. Demonstrable effects may have been lost due to contamination and other co-occurring interventions in the control group, as we also observed effects in the control group. The community-based intervention did have a small impact on transport-related physical activity at nine-month follow-up compared to the control community. Because transport is a necessary activity in daily life, people could decide to walk or cycle rather than using their car. The scores on general health are rather high in both groups. This could indicate that in particular relatively healthy older adults participated in this study. A possible reason for the increased levels of physical activity and fruit and vegetable consumption in the intervention and in the control groups at follow-up compared to baseline is an increase in health awareness following the completion of the questionnaires. Furthermore, seasonal changes might have occurred as the baseline measurement was taken in winter, while the follow-up measurements were in spring and summer.

**Strengths and limitations**

Strengths of this study include its use of multiple measurements over time, the presence of a control group and its excellent retention at follow-up. By taking multiple measurements immediately after the high-intensity and following low-intensity period, participants were followed over a longer period. Some limitations should also be mentioned. First, we used a self-report questionnaire, which might have increased measurement error compared to objective measures. Second, non-response was quite high, meaning that selection bias cannot be ruled out.

Further research is needed to assess whether community-based interventions targeting older adults in a socioeconomically disadvantaged community are cost-effective.

**Conclusions**

The systematically developed community-based intervention approach had limited effects on the physical activity and healthy eating of older adults, but has the potential to change health-related behaviour in this community given its high reach. To increase its effectiveness, a prolongation of the high-intensity intervention phase to more than one year might be warranted, with more attention on individual support by peers and professionals. Behavioural change of individuals is quite difficult and requiring changes in underlying social and cultural mores, processes which may take years.
References


