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Original Research Article

Short-term effects of a health promotion program targeting healthy nutrition, physical activity and social network enhancement among low-income multi-problem households in the Netherlands

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ABSTRACT

Background: Multi-problem households (MPHs) are less physically active, eat less healthy, have higher perceived stress and worse self-reported health. A health promotion program was developed for MPHs targeting self-reported health, physical activity, healthy nutrition and engagement in social networks. This paper described the effectiveness of this program.
Methods: A quasi-experimental study was conducted in the city Apeldoorn in the Netherlands with assessments at baseline and after six months. The primary outcome was self-reported health. Secondary outcomes were physical activity, fruit and vegetable consumption, social contacts, loneliness, mental health, BMI and lifestyle index. Data were analyzed with multilevel linear regression analyses.
Results: A total of 116 respondents signed up for participation, of which 90 respondents (77.6%) completed the follow-up questionnaire. No differences were found between the control and intervention group on self-reported health (p=0.84). No differences were found between the groups on fruit consumption (p=0.34), but a significant interaction of group×time×health literacy was found (p=0.02). Follow-up analyses showed that only for participants with high health literacy significant differences in fruit consumption were found between control and intervention group at post-test (ß=8.059, p=0.02). No significant differences were found on other outcomes.
Conclusions: Recruiting sufficient participants was a challenge. Significant differences in fruit consumption were found among individuals with a relatively high health literacy and none for the other primary and secondary outcome measures. Our outcomes indicate that health promotion programs, as well as their reachability, need to be further tailored to the needs of MPH.

Keywords: Multi-problem households, Lifestyle intervention, Social contacts, Low SEP

INTRODUCTION

MPH can be defined as low-income households that receive social care for multiple problems in their family lives such as debts, psychiatric disorders and domestic violence. The multitude and complexity of their problems often times contribute to a less healthy lifestyle compared to others. Research has shown that MPH are less physically active, eat less healthy and have higher perceived stress and worse self-reported health.[1,2]

In addition to an unhealthy lifestyle, MPH often have few social contacts and few social skills for maintaining relationships, making them prone to social isolation.[3,4] There is evidence to suggest that social isolation is also likely to contribute to differences in mortality by socioeconomic position (SEP).[5] MPH are multi-users of psychosocial care and healthcare, leading to increased healthcare expenditure. Studies have shown that individuals with a lower SEP in the Netherlands spend two to three times on health care than individuals with a higher SEP.[6,7] The increased health inequalities and health care expenditure of MPH makes it important to create targeted health promotion programs for them.

Currently, there are limited studies with high-quality designs that show evidence of effective interventions aimed at dietary intake and physical activities for socio-economically disadvantaged groups.[8] However, there are potentially promising interventions, which warrant further research. For example, there is evidence that physical activity programs for low SEP individuals can be effective in increasing physical activity.[9,10] Also, one review of community-based interventions aiming to improve cooking skills has shown that cooking interventions can have a positive effect in vulnerable, low-socioeconomic groups by improving confidence in cooking and fruit and vegetable consumption.[11] Furthermore, it has been suggested that community interventions can bring members of communities and organizations together to support each other and solve problems that are experienced by MPH.[12]

Previous research identified a number of barriers for health behavior change among MPH: high financial costs for sports and healthy nutrition, low motivation to increase physical activity and to change dietary intake and incorrect knowledge about healthy nutrition.[13,14] Recommendations about what kind of interventions MPH would like to participate in have been identified. For example, it has been recommended to organize free or cheap health promotion activities such as walking groups and cooking classes to learn how to prepare healthy, affordable meals and socialize by eating together.[13,15]

In light of previous promising results of several interventions and recommendations to target barriers for health behaviour change among MPH, the objective of this study was to evaluate a broad and integrated health promotion program for MPH targeting self-reported health, physical activity, healthy nutrition and engagement in social networks.

We expected that compared to the control group, the program in the intervention group will result in: increased self-reported health; more physical activity; healthier dietary intake; more engagement in social networks; increased mental health; decreased BMI and decreased loneliness. As there may be differences in intervention effects between age groups, gender and health literacy levels, follow up moderation analyses will be conducted.

METHODS

Study design

This study had a quasi-experimental design. This study was conducted from September 2017 until July 2019 in Apeldoorn, a municipality with 160,000 inhabitants in the Netherlands. Respondents from the southern part of Apeldoorn were enrolled in the intervention group and respondents from the northern part of Apeldoorn were enrolled in the control group. Respondents in the intervention group received the usual social services support for MPH and were offered the possibility to enroll in a health promotion program called "Back2Balance". The Back2Balance program targetted healthy nutrition, physical activity and social network enhancement. Respondents in the control group only received the usual social services support for MPH. Outcome variables were measured with questionnaires at two time points: at baseline (T1) and 6 months post-measurement (T2).

The study protocol was approved by the medical ethics committee of Zuyderland and Zuyd Hogeschool (METC number: 17-N-80) and the protocol was published elsewhere.[16]

Participants and recruitment

The target group of this study was MPH residing in Apeldoorn.

Eligibility criteria included: a disposable household income up to 150% of the minimum wage (€1400 net income for singles and €1900 net income for households); problems in more than one of the following areas in which social workers in Apeldoorn work: social networking and social participation, finances, mental health, physical health, addiction and domestic relations, day care, school or work, housing, delinquency; 12 years of age or older; residing in Apeldoorn or in the surrounding villages. Eligibility for participation in this study depended on the assessment of social workers and primary care professionals involved in the direct recruitment of the target group.

Exclusion criteria included: incomprehension of the Dutch language; having an intellectual disability; being a geriatric patient; unwilling to fill in the informed consent form; for minors aged 12-15 years old: parents who do not want to fill in the permission form (this age range was in line with the Dutch Medical Research Act).

Recruitment started in September 2017. First, social workers and primary care professionals were instructed to ask eligible clients and patients to participate in this study during a face-to-face meeting or by telephone. Participants were also recruited directly in community centers by the research team. After assessing eligibility, recruiters provided potential respondents information

about this study and a flyer. All professionals involved in recruitment were instructed to recruit individuals only after any urgent crises situation (e.g., unsafe home environment or a housing eviction) was solved. After agreeing to participate respondents signed an informed consent form.

Procedure

After signing up for participation, respondents filled in the first baseline questionnaire together with a researcher. Afterwards, information about the Back2Balance program was given and the possibility to enroll in the program was explained. Respondents had a 6-month period to enroll and participate in the program. After filling in the questionnaire they were encouraged to follow program components that they found interesting but were also explained that it was not obligatory to follow all program components. Before participating in the program respondents were also encouraged to specify health goals that they aimed to achieve and discuss health behavior change with the activity coordinator.

After enrolling in the program the activity coordinator contacted participants to inform them about the scheduled activities and to inquire about their preference for activities. Close contact was kept between the activity coordinators and participants in order to inquire about their participation and adjust plans whenever deemed desirable. With this participatory action research approach it was aimed to have a constructive collaboration between the involved researchers and participants in order to co-create the program elements in order to fit the needs of MPH.[17] This also meant that some components of the program changed during the course of this study.

Respondents in the intervention and control group received a filled grocery bag if they participated in this study. All respondents age 12- to 17-year-old who participated received a coupon of €10 that they could spend in a budget sports store.

The Back2Balance program

A health promotion program called Back2Balance was co-created that targets healthy nutrition, physical activity and social network enhancement. The program consists of the following components: walking groups, cooking workshops, motivational talks, discounts on existing health promotion programs, and family trips and activities for children. More information about the Back2Balance program can be found in the published protocol article.[16]

Sample size calculation

The sample size calculation was based on standardized effect sizes (d=0.41 and d=0.49) from two meta-analyses of interventions for a similar target group aimed at promoting family well-being and aimed at preventing children from being abused or from being removed from their residence.[18,19] Based on an effect size of d=0.41 for the main intervention effects, with 80% power and an alpha of 0.05 in a two-sided test, this study needed 95 respondents per group. Accounting for an expected drop-out rate of 30%, this study needed 136 respondents per group to enrol in this study.

Measurement instruments

Characteristics

Age was measured in years with an open question: *"What is your age?"* Gender was measured with the question *"What is your gender?"* (0=female; 1=male). Household composition was measured with an open question: *"How many people are in your household?"* Marital status was measured with the following question: *"What is your marital status?"* (response options: 0=single, 1=partner but not living together, 2=married, 3=widowed, 4=divorced). Adults' education was measured with the question: *"What is your highest completed education?"* (response options: 0=primary education, 1=preparatory secondary vocational education (VMBO), 3=senior secondary education (MBO), 4=senior secondary general education and pre-university education (HAVO and VWO), 5=higher professional education (HBO) and academic higher education (university)). Childrens' education was measured with the question: *"What education are you following?"* (response options: 0=primary education, 1=preparatory secondary vocational education (VMBO), 2=senior secondary general education and pre-university education (HAVO and VWO)). One question was used to assess whether the respondent had financial problems: *"To what extent can you make ends meet with your income?"* (response options: 1=very difficult, 2=difficult, 3=rather difficult, 4=rather easy, 5=easy, 6=very easy).

Primary outcome

Self-reported health was measured with one question: *"How is your health condition in general?"*, which people can answer on a five-point scale from "very good" to "very bad".[20,21] Pictures of smiley faces were added above the scale to facilitate interpretation.

Secondary outcomes

Physical activity, dietary intake (vegetable consumption, fruit consumption), BMI, social contacts, loneliness were mesasured. The International Physical Activity Questionnaires (IPAQ) questionnaire was used to measure physical activity.[22] Vegetables and fruits consumption were measured with questions from the public health monitor.[23] These questions measured how many times a week one consumed vegetables and fruit and a follow-up question about how much was consumed on a typical day (in serving spoons of vegetables or

pieces of fruit). BMI was calculated after asking respondents' length and weight. Social contacts were measured by the following three questions: *"How often do you have contact with one or more family members?"*, *"How often do you have contact with friends or acquaintances?"*, *"How often do you have contact with neighbors or people who live in your street?"* The following response options were provided: at least once a week, three times a month, two times a month, once a month, less than once a month, rarely or never. A sum score was constructed based on answers to the three questions. Mental well-being was measured using the 5-item mental health inventory in which three questions assessed depressive symptoms and psychological well-being and two questions measured anxiety symptoms.[24] Loneliness was measured by a 6-item validated scale for loneliness.[25]

A lifestyle index was calculated by aggregating scores on fruit consumption, vegetable consumption and physical activity. The index variable was created based on 50% adherence to guidelines for fruit intake, vegetable intake and physical activity. Participants who adhered for 50% or more to a guideline are assigned a score of 1 and a sum score was calculated for all behaviours (fruit consumption, vegetable consumption, physical activity). The value for this index could range from 0 to 3; higher scores indicated more healthy behaviours. The public health guidelines, according to the Health Council of the Netherlands, for each of these behaviours were as follows: being moderately physically active for 2.5 hours a week, eating 200 grams of vegetables per day, eating two portions of fruit per day (200 grams).

Moderator

Health literacy might play a significant role in improving health and could play an important role in the existing health disparities between low and high SEP groups.[26,27] Health literacy was measured by three questions assessing problems with understanding written information, confidence filling out medical forms and how often help was needed to read medical information.[28,29]

Adherence to the intervention

Participants in the intervention group were asked in which components of the intervention they participated and were asked at 6 months post-measurement whether they had any tips or improvement points for the intervention.

Minors that were 12 to 15-year-old received a shortened questionnaire that contained only questions about their general characteristics, the primary outcome measure and the secondary outcome measures. The questionnaire for minors was adapted to their level of language use.

Statistical analyses

Descriptive analyses were used to describe the sample of respondents in this study. Baseline differences between the control and intervention group were examined using a chi-squared test or Fisher's exact test for categorical variables, and using an independent samples t test for continuous variables. To investigate differences between intervention and control group in the change in self-reported health (primary outcome variable) between baseline and 6-month follow-up as well as in the change of fruit intake, vegetable intake, mental health, social contacts, loneliness, physical activity, BMI and a lifestyle index (secondary outcomes) between baseline and 6-month follow-up, data were analyzed with multilevel linear regression analyses using a random intercept model. Since measurement occasions (first level) were nested within respondents (second level) who were nested within families (third level), a three-level model was used. In a follow-up analysis, the following effect modifiers were added to the regression models: health literacy, gender and age. All analyses on the treatment effect were repeated for a subgroup of respondents who indicated that they had participated in 1 or more activities that were organized in the Back2Balance program (subgroup analyses).

All data were analyzed according to the intention-to-treat principle. Missing data in the outcome variables were not imputed, since the likelihood-based approach, similar to an approach based on multiple imputation, assumes missingness at random in dealing with missing values.30 A two-tailed test was considered statistically significant when the p value is at or below 0.05. All analyses were performed using the software program Statistical Package for Social Sciences (SPSS. 25).

RESULTS

A total of 116 respondents signed up for participation, of which 90 respondents (77.6%) completed the follow-up questionnaire (Figure 1). A drop-out analysis revealed that the age of respondents who completed the follow-up questionnaire (M=42.38, SD=15.5) and participants who dropped out (M=40.08, SD=15.7) did not differ significantly (t=0.66, p=0.51). A significant difference in gender was found between respondents who completed the follow-up questionnaire (35.6% men, 64.4% women) and participants who dropped out (57.7% men, 42.3% women; χ^2=4.10; p=0.043). Of the 90 respondents who completed the follow-up questionnaire, 49 were in the experimental condition and 41 in the control condition.

Table 1 presents baseline characteristics of the total sample in the analysis. Chi square tests showed no significant differences between control and intervention group on gender, marital status, education, number of people in household, number of children in household, and making ends meet. Independent samples t tests

showed that there were also no significant differences between control and intervention condition on age.

Primary outcome

No differences were found between the groups on self-reported health (p=0.84) (Table 2). When examining whether the group differences might depend on age, gender and health literacy, the interaction of group×time×age turned out to be significant (p=0.02), indicating a differential intervention effect, depending on age (Table 2). Age was therefore dichotomized into low age (12-44) and high age (45-80) by a median split. Follow-up analyses revealed that for the younger group no significant differences between control group and intervention group were found (ß=0.223, p=0.73). For the older group also no significant differences between control group and intervention group were found (ß=0.517, p=0.42). Differences between younger and older participants in intervention effects are displayed in Figure 2a and b.

Table 1: Sample characteristics.

Variables	Group		Statistical values
	Control (n=56)	Experimental (n=60)	
	N (%)	N (%)	
Sex			χ^2=0.07
Men	22 (39.3)	25 (41.7)	P=0.079
Women	34 (60.7)	35 (58.3)	
Age (years)			T test=1.45
Mean age (SD)	44.0	39.8	P=0.149
Marital status			
Single	24 (44.4)	20 (38.5)	
Living apart from partner	3 (5.6)	2 (3.8)	χ^2=5.96
Married, living together	13 (24.1)	22 (42.3)	P=0.174
Widow/widower	3 (5.6)	0 (0.0)	
Divorced	11 (20.4)	8 (15.4)	
Education adults			
Primary education	6 (11.5)	8 (15.4)	
Preparatory secondary vocational education (VMBO)	21 (42.3)	23 (44.3)	
Senior secondary education (MBO)	14 (26.9)	15 (28.8)	χ^2=3.26 P=0.928
Senior secondary general education & pre-university education (HAVO and VWO)	5 (9.6)	2 (3.8)	
Higher professional education (HBO) and academic higher education (university)	4 (7.7)	4 (7.6)	
Education children[a]			
Primary education	0 (0.0)	2 (25.0)	Fisher's exact test=2.96 P=1.000
VMBO	2 (100)	4 (50.0)	
HAVO and VWO	0 (0.0)	2 (25.0)	
Number of persons in household			
3 or more people in household	12 (22.6)	22 (42.3)	P=0.079
2 people in household	12 (22.6)	15 (28.8)	
1 person in household	27 (50.9)	15 (28.8)	
Number of children in household			
3 or more children in household	4 (8.0)	3 (5.8)	
2 children in household	5 (10.0)	7 (13.5)	χ^2=3.78
1 child in household	9 (18.0)	17 (32.7)	P=0.300
0 children in household	32 (64.0)	25 (48.1)	
Financial problems-making ends meet			
Very difficult	7 (13.5)	9 (17.3)	
Difficult	14 (26.9)	14 (26.9)	
Rather difficult	9 (17.3)	12 (23.1)	χ^2=4.76
Rather easy	9 (17.3)	7 (13.5)	P=0.459
Easy	9 (17.3)	10 (19.2)	
Very easy	4 (7.7)	0 (0.0)	

a=The small numbers reported in this variable is due to a low number of participants enrolled in this study.

Table 2: Results of linear mixed regression models for primary and secondary outcome measures.

Results	β	SE	95% CI		P value
Self-reported health[a]					
Group×time	0.03	0.17	-0.31	0.38	0.842
Time×gender	0.14	0.18	-0.21	0.50	0.420
Time×age	-0.00	0.01	-0.01	0.01	0.913
Time×healthliteracy	0.08	0.06	-0.04	0.21	0.185
Self-reported health[b]					
Group×time×gender	0.00	0.35	-0.71	0.70	0.990
Group×time×age	-0.03	0.01	-0.06	-0.01	0.020*
Group×time×health literacy	0.07	0.12	-0.17	0.31	0.566
Fruit intake[a]					
Group×time	1.40	1.46	-1.50	4.30	0.339
Time×gender	-0.38	1.49	-3.34	2.58	0.798
Time×age	0.00	0.06	-0.11	0.12	0.974
Time×health literacy	-0.63	0.52	-1.65	0.39	0.227
Fruit intake[b]					
Group×time×gender	1.92	3.00	-4.05	7.89	0.524
Group×time×age	-0.10	0.12	-0.33	0.13	0.394
Group×time×health literacy	2.42	1.03	0.37	4.46	0.021*
Vegetable intake[a]					
Group×time	2.36	2.25	-2.12	6.84	0.297
Time×gender	0.96	2.30	-3.62	5.54	0.679
Time×age	0.03	0.09	-0.15	0.21	0.752
Time×health literacy	0.34	0.81	-1.27	1.95	0.676
Vegetable intake[b]					
Group×time×gender	6.34	4.67	-2.96	15.65	0.178
Group×time×age	-0.04	0.18	-0.40	0.32	0.825
Group×time×health literacy	-1.00	1.64	-4.25	2.24	0.541
Mental health[a]					
Group×time	7.56	4.55	-1.50	16.63	0.101
Time×gender	-0.09	4.66	-9.36	9.18	0.984
Time×age	0.00	0.18	-0.36	0.37	0.982
Time×health literacy	2.12	1.65	-1.16	5.39	0.203
Mental health[b]					
Group×time×gender	6.31	9.41	-12.42	25.04	0.504
Group×time×age	-0.52	0.37	-1.25	0.21	0.160
Group×time×health literacy	4.82	3.31	-1.75	11.39	0.148
Social contacts[a]					
Group×time	0.81	0.76	-0.69	2.33	0.287
Time×gender	-0.54	0.78	-2.09	1.00	0.486
Time×age	-0.03	0.03	-0.09	0.03	0.340
Time×health literacy	0.50	0.27	-0.04	1.04	0.069
Social contacts[b]					
Group×time×gender	2.07	1.58	-1.06	5.21	0.193
Group×ime×age	0.01	0.06	-0.11	0.13	0.876
Group×time×health literacy	-0.57	0.55	-1.66	0.52	0.302
Loneliness[a]					
Group×time	-0.00	.29	-0.58	0.58	0.999
Time×gender	0.08	.30	-0.51	0.67	0.791
Time×age	-0.01	.01	-0.04	0.01	0.207
Time×health literacy	0.12	0.10	-0.08	0.33	0.230
Loneliness[b]					

Continued.

Results	β	SE	95% CI		P value
Group×time×gender	-0.01	0.62	-1.23	1.22	0.992
Group×time×age	0.00	0.02	-0.05	0.05	0.943
Group×time×health literacy	-0.09	0.21	-0.51	0.32	0.654
Physical activity[a]					
Group×time	301.30	915.86	-1519.46	2122.07	0.743
Time×gender	164.39	935.03	-1694.27	2023.05	0.861
Time×age	-30.43	36.26	-102.43	41.56	0.403
Time×health literacy	406.86	321.98	-230.90	1044.66	0.209
Physical activity[b]					
Group×time×gender	1098.53	1922.72	-2725.54	4922.61	0.569
Group×time×age	0.64	74.46	-147.31	148.59	0.993
Group×time×health literacy	-240.93	655.65	-1540.06	1058.21	0.714
BMI[a]					
Group×time	0.14	0.48	-0.82	1.10	0.775
Time×gender	-0.73	0.49	-1.72	0.25	0.142
Time×age	-0.03	0.02	-.070	0.01	0.155
Time×health literacy	-0.19	0.19	-0.58	0.19	0.329
BMI[b]					
Group×time×gender	-2.55	0.96	-4.47	-0.64	0.010*
Group×time×age	0.03	0.04	-0.05	0.11	0.431
Group×time×health literacy	-0.40	0.37	-1.14	0.34	0.283

a=Main effects and first-order interactions were included in all models, but only first-order interactions are presented in this table; b=main effects, first-order interactions and second-order interactions were included in all models, but only second-order interactions are presented in this table (as only second-order interactions can be interpreted unambiguously); abbreviations: [a]=dependent variable; β=regression coefficient; CI=confidence interval; SE=standard error; *=significant at P value ≤0.05.

Table 3: Number of participants and main improvement points.

Participants	Cooking class	Walking group	Discounts on existing health promotion programs	Family trips	Activities for children
Participants-at least once present	18	16	15	22	14*
Time of activity did not suit participant/participant preferred other time slots	x	x	x		
Parking near activity was expensive				x	
The food in the cooking class wasn't to the taste of participant	x				
Did not participate due to problems/situation at home	x	x	x	x	x
Participant had unpleasant experiences at the gym			x		
Participants preferred other activities for children					x
Activities were not structured enough				x	x

*Including parents.

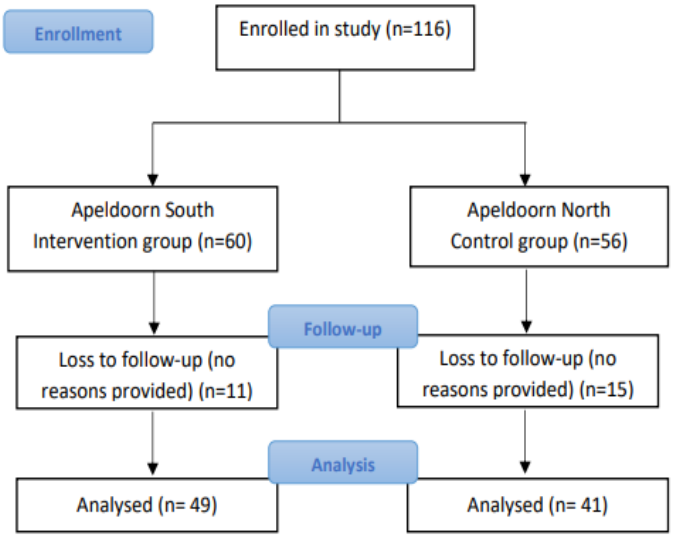

Figure 1: Flowchart of participation.

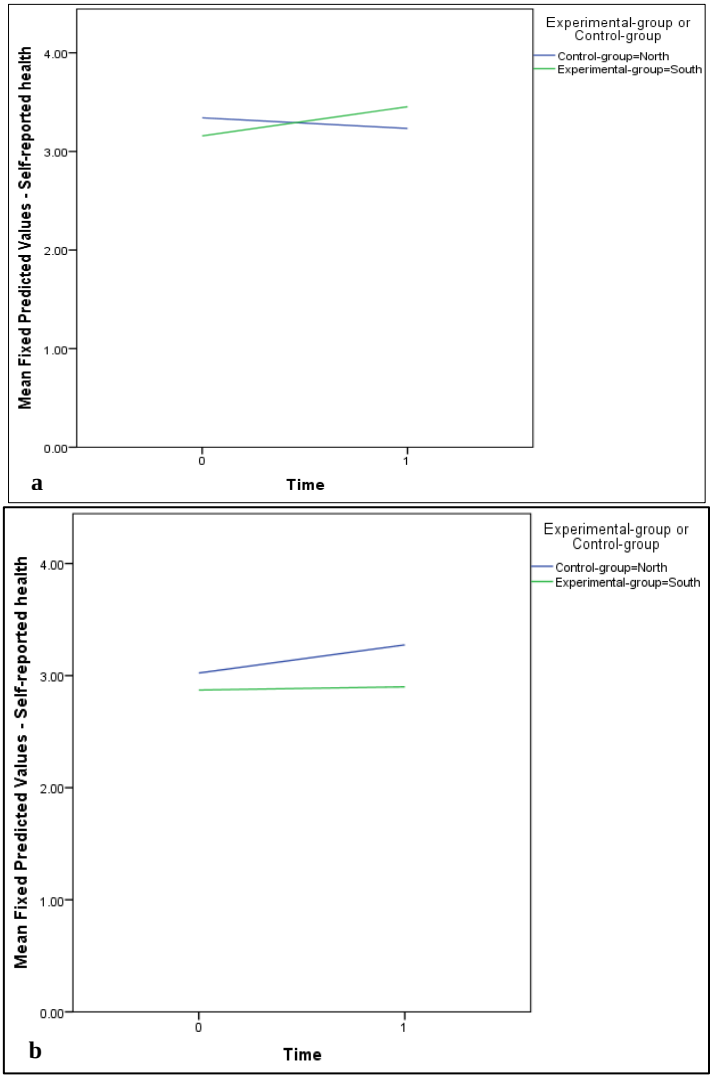

Figure 2: (a) Intervention effects: participants <44 years; (b) intervention effects: participants >45 years.

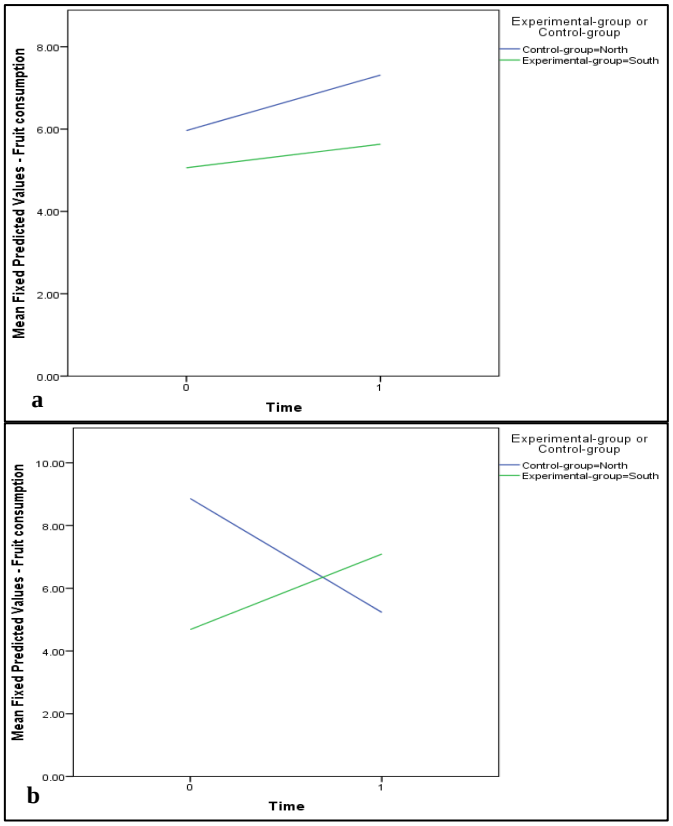

Figure 3: (a) Intervention effects-low health literacy; (b) intervention effects-high health literacy.

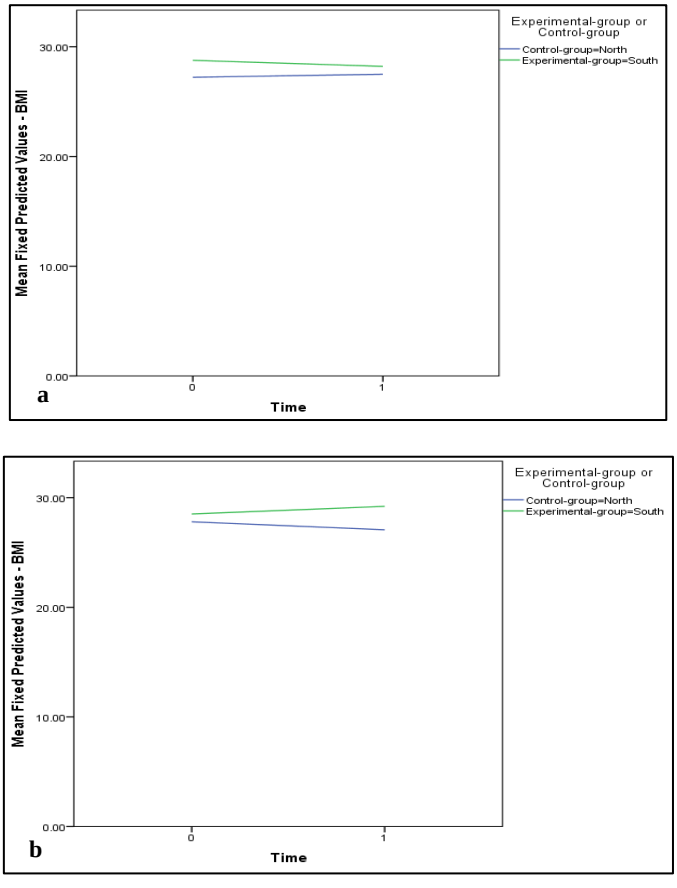

Figure 4: (a) Intervention effects-men; (b) intervention effects-women.

Secondary outcomes

For the outcome fruit consumption no differences were found between the groups (p=0.34) (Table 2). However, a significant interaction of group×time×health literacy was found (p=0.02), which indicated a different intervention effect depending on health literacy. Participants were categorized into a high health literacy group and a low health literacy group by a median split. Follow-up analyses showed that for the low health literacy group no significant differences between control group and intervention group were found (ß=-0.504, p=0.85). For the high health literacy group significant differences between control group and intervention group were found (ß=8.059, p=0.02), indicating a higher average fruit consumption per week for the intervention group compared to the control group. Differences in intervention effects between participants with a low health literacy and participants with a high health literacy are displayed in Figure 3 a and b.

For BMI a significant group×time×gender interaction was found (p=0.01), which suggested that the intervention effect may differ depending on gender. Follow-up analyses showed that for men no significant differences between control group and intervention group were found (ß=-1.757, p=0.14). The negative regression coefficient showed that for men the intervention led to a lower BMI as compared to the control group, but the difference failed to reach significance (Figure 4a). For women also no significant difference between control group and intervention group was found (ß=1.408, p=0.559) (Figure 4b).

For the outcome vegetable intake, mental health, loneliness, physical activity no significant group×time interactions were found (Table 2).

Partial compliance with guidelines

For the outcome lifestyle index no significant group×time interaction was found (ß=-0.01, p=0.958), as well as no significant effect modifiers: group×time×gender (ß=0.24, p=0.440); group×time×age (ß=0.07, p=0.835); group×time×health literacy (ß=-0.02, p=0.881).

Adherence to the intervention

All 49 participants in the intervention group were provided with the opportunity to participate in the Back2Balance program, but not everyone actually participated in the program. Thirty-three respondents participated actively in the program by participating in the walking group, cooking class, family trips, activities for children and/or using the discounts on existing health promotion programs, whereas 16 participants have not used the opportunity to participate in these activities. They were given the opportunity to participate in the intervention and may have participated in the Facebook group, where healthy recipes were shared. The family trips and cooking class attracted the most participants (Table 3).

Subgroup analyses

In the subgroup analyses, participants who participated actively in the Back2Balance program (n=33) were compared to the control group (n=56). Similar results were found when comparing the control group to the subgroup of participants that indicated to have participated in at least one activity.

DISCUSSION

This study investigated the effectiveness of a health promotion program targeting healthy nutrition, physical activity and social network enhancement among low-income multi-problem households in the Netherlands. This study found no significant difference in self-reported health between the intervention group and control group. Among individuals with a relatively high health literacy, significantly higher levels of fruit consumption per week was found for the intervention group compared to the control group. There were no significant differences at post-measurement between the intervention and control group for other secondary outcomes.

Reflection and comparison with literature

Our health promotion program was focused on delivering enjoyable activities and enhancing social networks. Throughout the study close contact was kept with participants in order to inquire about their needs and wishes and adjust plans whenever necessary.[16] Our results were in line with previous studies that found limited evidence of community-based interventions such as interventions aimed at diet and physical activities for socio-economically disadvantaged groups.[31]

Among the individuals with higher health literacy, we found an intervention effect on fruit consumption. This finding may be due to the fact that individuals with higher health literacy benefited more from our intervention because of greater capacity to obtain, process, and understand the health information which is needed to make health decisions.[32] However, in contrast to the intervention group, individuals with high literacy levels in the control group reported a decrease in fruit consumption. Therefore, we suspected that the differences between control and intervention group in the high literacy group could had been due to a type I error. Furthermore, a consequence of low power was that the probability that there was no real effect given a statistically significant result (false discovery rate) will be high. We should therefore be careful to draw conclusions about the effects of the intervention on fruit consumption.

Other studies had reported increased inequality in health outcomes between different socioeconomic groups.[33-35] However, our target population consisted only of low

SEP individuals from MPH. Nevertheless, it was important to acknowledge that MPH were a heterogeneous group with different needs, different levels of health literacy as well as different complexities of problems.[36] To not increase health inequalities between those with higher health literacy and those with lower health literacy, it was important to develop interventions that were easily understandable and more in line with the needs of individuals with lower health literacy.

The limited effects observed in this study indicated that health promotion programs for MPH as well as their reachability, needed to be further developed and tailored to the needs of MPH. It was a challenge to change multiple outcomes with health promotion programs, especially among MPH. It was therefore probably more realistic to have an approach that focused on fewer outcomes. As participants could only attend to the Back2Balance program for six months, it can be beneficial to expand participation time and possibly increase the effects seen of such interventions. New opportunities to reach this population have to be further investigated using innovative approaches in communities. Additionally, given the current state and limited effects of health promotion interventions targeting MPH, government policies that subsidize healthy food and physical activity and tax unhealthy food (e.g. a tax on sugar-sweetened beverages) were needed. Additionally, policies that supported and empowered MPH with low SEP to decrease the multitude of problems they often experienced, may also help to positively influence their health behaviours and health.

Strengths

No studies had been conducted before that investigated a broad and integrated health promotion program for MPH. The Back2Balance program was developed based on two preparatory studies and was co-created with the target group and social workers.[16,37,38] This study had a participatory action research approach in which the researchers and participants collaborated by planning, observing and reflecting on the program elements together.

Limitations

One major limitation was that we were not able to enrol the required number of MPH in the study, which limited the power of the study. It was therefore possible that not all true differences in outcomes between the intervention and control group were found. Initially we had recruited MPH through social workers, but the involvement of other professionals who worked with MPH, might be worthwhile for recruitment. Many social workers indicated that lifestyle and social network were important topics, but that they lacked time to discuss these topics because there were often more urgent issues to discuss, such as out-of-home placements or debts. On the other hand, this study showed that MPH did not only need an accessible program, but also intensive and regular encouragement of professionals (such as social workers) to participate and to prevent them from dropping out. Social workers who were specialized into lifestyle and who referred MPH to health promotion programs and encouraged MPH to participate and continue with the program might be needed to reach MPH and achieve larger effects.[13] Another possible limitation was the used questionnaire about health literacy. A recent validation study had shown that the questionnaire might not be sufficiently able to identify individuals outside the United States with different health literacy levels.[39] Furthermore, respondents in this study may had a tendency to answer in a socially desirable way. Response bias and selection bias might have also played a role as the sample of respondents in this study might differ from our population of interest due to self-selection.

CONCLUSION

Recruiting sufficient participants was a challenge. Significant differences in fruit consumption were found among individuals with a relatively high health literacy and none for the other primary and secondary outcomes. Our results indicate that health promotion programs, as well as their reachability, need to be further tailored to the needs of MPH.

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