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**The effect of out-of-home activity intervention delivered by volunteers on depressive symptoms among older people with severe mobility limitations:
a randomized controlled trial**

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The effect of out-of-home activity intervention delivered by volunteers on depressive symptoms among older people with severe mobility limitations: a randomized controlled trial

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Abstract

Objectives: To examine the effects of an individualized outdoor activity intervention carried out by volunteers on depressive symptoms among community-living older people with severe mobility limitations who have difficulties accessing the outdoors independently.

Methods: Secondary analyses of the “Volunteering, Access to Outdoor Activities and Wellbeing in Older People” (VOW) data (ISRCTN56847832). VOW was a randomized single blinded two-arm controlled trial conducted in Jyväskylä, Finland, in 2009-2011. At baseline, 121 people aged 67-92 years with severe mobility limitations were interviewed at home and randomized into either an intervention or waiting list control group. Volunteers (n=47) had retired from regular work and were trained for the study. A volunteer assisted the participant in attending recreational out-of-home activities once a week for three months. Depressive symptoms were assessed using the Center for the Epidemiological Studies Depression Scale (CES-D).

Results: In the intervention group the CES-D score did not change during the intervention (from $15.1 \pm$ standard error 0.9 to 15.1 ± 0.9), while in the control group it increased from 17.0 ± 1.3 to 19.1 ± 1.4 (intervention effect $p=.096$). Among the subgroup with minor depressive symptoms at baseline (CES-D score 16-20), the CES-D score decreased in the intervention group and increased in the control group ($p=.025$).

Conclusion: A three-month outdoor activity intervention may improve mood among older people with severe mobility limitations. More randomized controlled trials of the topic are needed.

Key words: Depression, volunteering, out-of-home activity, older people

Introduction

Participation restriction in different areas of life is common among older adults, particularly outside the home (Wilkie, Peat, Thomas, & Croft, 2006). For example, approximately 40% of women aged 70-79 years, and over 60% of women over 80 years report restrictions in out-of-home activities (Wilkie et al., 2006). Extreme activity restriction refers to a situation where a person is unable to move independently outside the home and becomes homebound (Choi & McDougall, 2007), and thus at risk for isolation from out-of-home activities and, further, for severe functional decline (Cohen-Mansfield, Shmotkin, & Hazan, 2010; Cohen-Mansfield, Shmotkin, & Hazan, 2012).

Previously, it has been reported that homebound older people have a very high rate of depressive symptoms compared to community-living people, who are able to participate in out-of-home activities (Choi & McDougall, 2007; Cohen-Mansfield et al., 2010). However, the temporal order of events remains unclear. Some studies have shown that depressive symptoms increase the risk for activity restriction (Carriere et al., 2011; Rosqvist et al., 2008; Wilkie, Peat, Thomas, & Croft, 2007) and predict functional decline (Penninx et al., 1998), while others have shown that activity restrictions and functional limitations increase depression (Carriere et al., 2011; Choi & McDougall, 2007; Hirvensalo et al., 2007; Lampinen, Heikkinen, & Ruoppila, 2000).

Several physical activity interventions have been conducted with the aim of improving mood and decreasing depression among older people, but the benefits of such interventions have been inconsistent (for review see Cooney et al. 2013); while some have reported positive effects of physical activity interventions on depression (Pakkala et al., 2008), some have found that exercise interventions have failed to alleviate depression in community-living persons (Pfaff et al., 2013).

Current health care policy favors home care rather than institutional care (Ministry of the Environment, 2013), which has led to a situation where increasingly frail people not able to access the outdoors independently continue living in their own homes. Volunteers could facilitate out-of-home activity for people who have difficulty accessing the outdoors independently. People, who have recently retired, are looking for ways to be active and engage with their communities. They may serve as a resource for volunteering, given that the activity is attractive to them, well organized and that volunteers are trained and supported.

The aim of the present study was to investigate the effects of an out-of-home activity intervention conducted by older volunteers on depressive symptoms among community-dwelling older people with severe mobility limitation. We hypothesized that an out-of-home intervention carried out by older volunteers would decrease depressive symptoms among the target population by increasing their possibilities for recreation or running errands, which potentially support their social role.

Methods

Design

The present study is based on secondary analyses of the “Volunteering, Access to Outdoor Activities and Wellbeing in Older People” (VOW) data (ISRCTN56847832). The VOW project was a three-month, single blinded, two-arm, randomized controlled trial (RCT) conducted in Jyväskylä, Finland, in 2009-2011, targeted to community-dwelling people with mobility limitation who have difficulty accessing the outdoors by themselves. The primary outcome of the study was quality of life (Rantanen et al. submitted). The study design is shown in Figure 1.

The VOW project was approved by the Ethical Committee of the Central Finland Central Hospital. Participants were informed about the research and they signed an informed consent.

Participants and data collection

The recruitment process has been described earlier (Rantanen et al. 2014, submitted). Briefly, participants were recruited through municipal home care services and other outpatient care facilities of the city of Jyväskylä. The personnel gave a brochure to a potential participant and requested permission to pass on his/her telephone number to the research coordinator. The research coordinator called to each potential participant to explain the study in more detail. For those consenting to participate, a short telephone interview was conducted to gain a preliminary idea of the suitability of the person for the study. The inclusion criteria were: age 65 years or over, living alone in the community, having severe difficulties in accessing the outdoors independently, able to communicate in a coherent way, and consent to participate in a RCT. Those who were apparently healthy enough not to need the services of a volunteer

were excluded. Also excluded were people whose problems were too severe for the lay volunteers to manage, such as people who were not able to communicate in a coherent way or people who were predominantly bedridden. After the telephone discussion, all potential participants were sent a written description of the study and an informed consent form, the idea being to give them the opportunity to read the description and the consent form in their own time and discuss it with a trusted person. After a few days, the potential participants were visited by a trained interviewer who was available to discuss the study in more detail and who then collected the signed written consent and conducted the standardized interview and tests. After the knowledge of this program spread to the community, some participants were enrolled in the study by themselves or by their family members. A total of 121 persons considered suitable for the study were enrolled.

Volunteer workers

The volunteers were recruited from among people who had already retired from the regular workforce. Recruitment extended from 2008 to 2010 via local newspapers, events targeted to older people, the University of the Third Age of Jyväskylä, senior exercise groups in the city of Jyväskylä and by informing the general public about the project through the media. The inclusion criteria for volunteers were being retired and participation in the three-day training provided by us.

We organized eight orientation courses for a total of 55 volunteers. Of these, 47 joined the study. The mean age of the volunteers was 66.0 (standard deviation 5.9) years and 89 % of them were women. They had retired on average at the age of 60 years (range 50-68 years). In addition, we recruited college students to serve as volunteers for the control group members who received the outdoor activity program after their follow-up assessments. The

students underwent the same orientation sessions and the same self-evaluation as the older volunteers. Training covered the general principles of volunteering, safety issues when working with older people with mobility limitations, social interaction skills and research-related duties, rights and responsibilities. Discussion and role-playing situations that could potentially take place during the intervention formed an important part of the training content. Self-assessment was the primary method of evaluating the suitability of the volunteer workers for the program. During the orientation course, we gave a comprehensive picture of the expected tasks so that the volunteers could self-assess whether they were compatible with the assignment.

During the intervention, volunteers had an opportunity to participate in a meeting once a month to discuss their experiences and issues related to the study. Volunteers were asked to keep a diary of their meetings with the participants.

Intervention

Each participant was assigned a personal volunteer worker. Pairs were selected on a discretionary basis, including the closeness of their homes. The research coordinator attended the first meeting between the participant and the volunteer and went through the idea behind the intervention. Together, the volunteer, the participant and the coordinator discussed the out-of-home activities that interested the participant, what the intervention should include, and drew up an activity plan for the intervention period. The intervention was individualized and implemented according to the participants' interest. The intervention included activities related to exercise and culture, and daily errands such as shopping or going to a bank. The volunteer and the participant met once a week for a three-month period.

Control group

The control group was assigned to a waiting list for a similar outdoor activity intervention period in three months' time. Control-group members were interviewed at baseline and at the end of the control period.

Measurements

The outcome measure of the present study, depressive symptoms, was assessed with the Centre for Epidemiologic studies Depression Scale (CES-D) (Radloff, 1977). The CES-D scale is a widely used self-report measure in community samples. Its reliability and validity have been demonstrated in heterogeneous samples (Beekman et al., 1997). The CES-D assessment consist four dimensions; depressive affect, positive affect, somatic and retarded activity and interpersonal difficulties (Radloff, 1977) and includes 20-items where the respondent rates the frequency of the listed symptoms during the previous week. The validated cut-off score indicating an increased risk for clinically important depressive symptoms in community-living populations is 16 or more of the possible 60 points (Radloff & Teri, 1986) while the cut-off score of 21 has been found to indicate major depressive symptoms (Lyness et al., 1997). In the present study, in addition to the total CES-D score, participants were classified into three groups: no depression (CES-D <16), minor depressive symptoms (CES-D 16-20) and major depressive symptoms (CES-D \geq 21). In the present study the internal consistency of the CES-D scale was good: Cronbach's alpha was 0.83 at baseline and 0.86 at follow-up.

Loneliness was asked with a single question "Do you feel lonely?" with the response options 1) rarely or never, 2) sometimes, 3) often. **Self-rated health** was assessed with an age-comparative question, "How would you evaluate your health compared to others of same age?" with the response options 1) a lot better, 2) better, 3) about the same, 4) worse, 5) a lot worse. Responses were recoded as good (1-2), fair (3) and poor (4-5). Information on

chronic conditions was elicited during the at-home interview by the question: “Do you have any disease or defect diagnosed by a doctor that has lasted over 3 months?” and the response written down by the interviewer. **Socio-economic indicators** were perceived financial situation (good or very good, moderate, poor or very poor) and years of education.

Outdoor walking difficulty was studied as perceived difficulties in walking 0.5 km. The question was formulated as follows: “Do you have difficulty in walking 0.5 km?” with the response options: 1) able to manage without difficulty, 2) able to manage with some difficulty, 3) able to manage with great deal of difficulty, 4) able to manage only with the help of another person, and 5) unable to manage even with help. For the descriptive statistics, walking difficulties were recoded as ‘no difficulty’ (1), ‘have difficulty’ (2-3) and ‘need help or unable’ (4-5).

Power calculations

The power calculations were performed for the primary outcome of the study, the environmental subscore of the World Health Organization Quality of Life Assessment short version, WHOQOL-BREF (The WHOQOL Group, 1998). A total of 90 participants were needed for an 80 percent probability to detect a treatment difference at a two-sided 0.05 significance level, if the true difference between the intervention and control groups is 6 units. As we were recruiting old, vulnerable participants, it was necessary to take into account possible attrition and possible adverse events not related to the intervention. To allow for 20 % study attrition (common in comparable populations), our goal was to recruit 120 participants for the study.

Randomization

After the baseline at-home interviews, participants were randomized into an individualized recreational out-of-home activity intervention group (n=60) and a control group (n=61). The study coordinator sent the participant's study ID to a statistician not otherwise involved in the study, who then performed randomization and send the group allocation code to the coordinator. The randomization sequence was generated by a computer-generated random list (www.psychicscience.org) using block sizes of 12.

Statistical methods

Baseline characteristics were described using means and standard deviations or percentages, and the differences between the intervention group and the control group were analyzed using chi-square tests for the categorized variables and *t* tests for the continuous variables.

The intervention effect was analyzed with ANOVA for repeated measures. This modelling indicates the effects of group, time, and group x time interaction (intervention effect) on the change in the CES-D sum score and dimensions over the three month intervention. We conducted intention-to-treat analyses using the expected score calculated on the basis of the baseline value of the individual and percentage of average change in the study population. For one person who died during the intervention, data were not imputed.

Subgroup analyses were performed for those with no depressive symptoms at baseline (CES-D score < 16), those with minor depressive symptoms at baseline (CES-D score 16-20) and for those with major depressive symptoms at baseline (CES-D score \geq 21). PASW statistics version 20.0 (SPSS Inc., Chicago, IL) was used for all statistical analyses. When $p < .05$, the results were regarded as statistically significant.

Results

Participants

The mean age of the participants (n=121) was 81.9±5.9 years and 90 % were women. The baseline characteristics of the intervention and control groups were comparable (Table 1). The study flow chart is shown in Figure 2. In the intervention group, one person died during the intervention and three persons dropped out. In the control group eight persons dropped out; one person declined immediately after the baseline interviews because of an injurious fall and seven persons could not be reached after the three-month control period. Analyses were conducted according to the intention-to-treat principle, and hence 59 participants in the intervention group and 61 participants in the control group were included in the analyses.

Intervention adherence

The intervention included, on average, 10 meetings (range 0-16) between the participant and the volunteer, during approximately 8 of which the participant and volunteer went outdoors. The intervention was fully individualized, as the participants decided on the out-of-home activities they wanted to do during the intervention period. Most commonly, the participants chose activities related to daily living, such as going to a shop, bank, pharmacy or buying lottery tickets from the kiosk, or just walking outdoors in the nearby environment. Of the participants in the intervention group who continued to the end of the study, 46 (82%) received at least 7 visits by the volunteer. The reason for almost all missed visits was decline in the health of the participant. For seven participants, data on the frequency of visits was missing.

Depressive symptoms

Of all the study participants, 47.9 % had no depressive symptoms at baseline (CES-D score < 16). The prevalence of minor depressive symptoms (CES-D score 16-20) was 26.4 % and that of major depressive symptoms (CES-D score ≥ 21) 25.6 %. There were no statistically significant differences between the intervention and control group in the proportions with depressive symptoms at baseline (Table 1).

In the intervention group the CES-D score remained at the same level over the intervention (from $15.1 \pm \text{Standard Error } 0.9$ to 15.1 ± 0.9), while in the control group it increased from 17.0 ± 1.3 to 19.1 ± 1.4 . The intervention effect was on the borderline of statistical significance (group by time interaction $p = .096$, Table 2). The effect of the intervention on the depressive affect dimension of CES-D was parallel even though it did not reach statistical significance, while for the other dimensions no effects could be detected (depressive affect, $p = .113$; positive affect, $p = .210$; somatic and retarded activity, $p = .878$; and interpersonal difficulties $p = .661$).

Among the subgroup who showed no depressive symptoms at baseline, the CES-D score increased significantly in both the intervention and control groups (time effect $p = .003$), but no intervention effect was observed. Among those with minor depressive symptoms at baseline, a significant intervention effect was observed ($p = .025$), the CES-D score decreasing in the intervention group and increasing in the control group. Among those with major depressive symptoms at baseline, the CES-D score decreased slightly in the intervention group and increased in the control group, but the intervention effect did not reach statistical significance (Table 2). There were no differences in the results when the analyses were performed per protocol vs. intention-to-treat.

Adverse events

There were no adverse events related to the intervention among either participants or volunteers. However, it should be noted that there were multiple adverse health events among participants during the intervention period but they were unrelated to the intervention.

Discussion

These secondary analyses of the randomized controlled trial suggest that a volunteer-assisted out-of-home activity intervention may reduce depressive symptoms among older community-dwelling people with severe mobility limitations. The subgroup analyses showed that the intervention was effective for those with minor depressive symptoms, but no effect was found among those with no or major depressive symptoms. The findings of the present study support further studies on the topic.

Our results are in line with earlier studies on the effects of outdoor activities on different aspects of wellbeing. Mobility limitations hindering going outdoors (Choi & McDougall, 2007) and low frequency of going outdoors are associated with depressive symptoms and poor subjective health (Fujita, Fujiwara, Chaves, Motohashi, & Shinkai, 2006; Kono, Kai, Sakato, & Rubenstein, 2007). Even a small amount of outdoor activities, e.g. at least once a week, is beneficial for maintaining physical functioning (Shimada et al., 2010). A study among dementia patients found that also passive interaction with nature, such as sitting on a park bench, has positive effects on mood (Bossen, 2010). It has been found that spending time in natural environments increases restorative experiences, such as relaxation and calmness, and helps to forget worries (Korpela, Ylen, Tyrvaainen, & Silvennoinen, 2010)

Minor depressive symptoms are more common among community-dwelling older people than major depression (Buhtemann, Luppá, Bramesfeld & Riedel-Heller 2012). Minor depressive symptoms increase the risk of more severe depression, decline in functioning and increase need of help (for review, see Lyness 2008) and thus it has been suggested that prevention research should focus on this group (Lyness, Chapman, McGriff, Drayer & Duberstein 2009). In the present study, those with minor depressive symptoms seemed to benefit most from the intervention. The benefits were most evident in the CES-D dimensions of depressive and positive affect. There are several possible explanations for the improvements among those with minor depressive symptoms. First, for many participants, the intervention, implemented by an older volunteer, increased their social interaction, which may positively influence mood (Isaac, Stewart, Artero, Ancelin, & Ritchie, 2009). Second, the volunteer helped the participant to accomplish goals related to out-of-home activities. Tasks that the participant had been unable to do for a long time, may provide a sense of accomplishment and decrease depressive symptoms (Benyamini & Lomranz 2004). Third, the intervention may have enhanced feelings of autonomy, which interrelates with mood among older people (Kono, Kai, Sakato, & Rubenstein, 2004). Fourth, the intervention increased physical activity and improved perceived physical functioning (Rantanen et al. 2014), which, in turn, may be manifested as a reduction in depressive symptoms (Sjosten & Kivela, 2006). The findings of the present study support the need for further studies among those with minor depressive symptoms.

The study has some limitations which should be noted when interpreting the results. First, the present study is based on secondary analyses of a randomized controlled trial aimed at improving quality of life among older people (Rantanen et al. 2014, submitted).

Second, it is possible that the present study was underpowered, since the power calculations were performed according to the primary outcome of quality of life. In the subgroup analyses,

in particular, the number of participants in each group was rather low, and the randomization may not hold for these groups. To achieve a statistically significant result for the total study population, we would have needed 148 participants instead of 121 as in the present study. Third, our intervention period was just three months with only one meeting a week. For some participants, the number of meeting was much fewer owing to illness or other obstacles, which meant that for them the intensity of the intervention was very low. Fourth, we used CES-D scale to assess depressive symptoms, which is a validated and reliable tool, but it should be noted that it cannot be used as a clinical diagnostic method.

The strengths of the study are the unique features of the pragmatic effectiveness trial, including the target group, the inclusion of retired volunteers in, the community setting, and the content of the intervention. The effectiveness trials study the effect of the intervention in a “real-world” situation and thus the results may be easily transferred to practice. The intervention described in the present study showed good external validity, in terms of successful recruitment of participants and randomization, clinically relevant outcome and intervention that was found to be feasible and inexpensive to conduct in a community setting. There were no adverse effects related to the intervention. We focused on the benefits of volunteer work on its recipients, while the target group has usually been those performing the volunteering (von Bonsdorff & Rantanen, 2011). In addition, we were able to collaborate with municipal home care agencies to recruit homebound older people to the study, even though persons who are isolated from many out-of-home activities are a challenging group to locate and recruit for research (Crawford Shearer, Fleury, & Belyea, 2010).

Conclusions

The current results suggest that volunteer-assisted out-of-home activity interventions are useful for health promotion among older people who are not able to access the outdoors

independently. Access to outdoors is important for the well-being of older people. Older people, who are not able to access the outdoors independently and become unable to enjoy the community amenities due to restricted life-space, have declined well-being (Rantakokko, Portegijs, Viljanen, Iwarsson, & Rantanen, 2013). These secondary analyses suggesting that an out-of-home activity intervention, implemented by older volunteers, may improve mood among older people with severe mobility limitations provide justification for further studies and program development.

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Disclosure statement

The authors declare no conflict of interest.

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Table 1. Baseline characteristics of the intervention and control group in the randomized controlled trial “Volunteering, Access to Outdoor Activities and Wellbeing in Older People”-project.

Variable	Intervention		Control		p-value
	n=60		n=61		<i>t</i> -test
	Mean	(SD)	Mean	(SD)	
Age	82.0	(6.3)	81.9	(5.6)	.928
CES-D score	15.2	(6.7)	17.0	(10.0)	.262
Number of chronic conditions	3.0	(1.8)	3.0	(1.7)	.796
Years of education	9.8	(3.9)	9.0	(3.8)	.262
	n (%)		n (%)		X ²
Gender					.976
Male	6 (10.0)		6 (9.8)		
Female	54 (90.0)		55 (90.2)		
CES-D score					.150
<16	30 (50.0)		28 (45.9)		
16-20	19 (31.7)		13 (21.3)		
≥21	11 (18.3)		20 (32.8)		
Feeling lonely					.475
Rarely or never	28 (46.7)		24 (39.3)		
Sometimes	24 (40.0)		24 (39.3)		
Often	8 (13.3)		13 (21.3)		

Self-rated health			.478
Good	12 (20.0)	16 (26.2)	
Fair	29 (48.3)	23 (37.7)	
Poor	19 (31.7)	22 (36.1)	
Perceived financial situation			.949
Good or very good	15 (25.0)	16 (26.2)	
Moderate	37 (61.7)	38 (62.3)	
Poor or very poor	8 (13.3)	7 (11.5)	
Difficulties in 0.5 km walking			.250
No difficulty	20 (33.3)	20 (32.8)	
Have difficulty	23 (36.7)	14 (24.6)	
Need help / unable	18 (30.0)	26 (42.6)	

CES-D= Centre for Epidemiologic Studies Depression Scale

Table 2. The effects of out-of-home intervention carried out by older volunteers on CES-D sum score among all study subjects and among sub-groups of no, minor and major symptoms at baseline.

CES-D score	Intervention	Control	Group	Time	Group x time
	(n=59)	(n=61)			
	Mean (SE)	Mean (SE)	<i>p</i> -value	<i>p</i> - value	<i>p</i> -value
Total study			.057	.086	.096
population					
Baseline	15.1 (0.9)	17.0 (1.3)			
Follow-up	15.1 (0.9)	19.1 (1.4)			
Average change %	0	+12.4			
Sub-groups					
No symptoms (CES-D <16)			.307	.003	.804
Baseline	9.7 (0.6)	8.3 (0.9)			
Follow-up	12.1 (1.0)	11.1 (1.3)			
Average change %	+24.7	+33.7			
Minor symptoms (CES-D 16-21)			.041	.826	.025

Baseline	18.2 (0.3)	18.4 (0.3)
Follow-up	15.8 (1.4)	21.2 (2.1)
Average change %	-13.2	+15.2

Major symptoms .092 .607 .317

(CES-D >21)

Baseline	25.4 (1.0)	28.2 (1.5)
Follow-up	23.1 (2.3)	28.9 (2.1)
Average change %	-9.1	+2.5

CES-D=Centre for Epidemiologic Studies Depression Scale.

SE=Standard Error

FIGURE LEGENDS

Figure 1. The study design of the “Volunteering, Access to Outdoor Activities and Wellbeing in Older People” (VOW) project, conducted in Jyväskylä, Finland in 2009-2011.

Figure 2. The study flow of the “Volunteering, Access to Outdoor Activities and Wellbeing in Older People” (VOW) project, conducted in Jyväskylä, Finland in 2009-2011.