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Physical activity, social network type and depressive symptoms in late life: An analysis of data from the National Social Life, Health and Aging Project

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Abstract

Objectives—To clarify whether physical activity among older Americans is associated with depressive symptoms, beyond the effects of social network type, physical health and sociodemographic characteristics.

Method—The analysis used data from a sub-sample, aged 65–85, from the National Social Life, Health and Aging Project ($N = 1,349$). Hierarchical regressions examined the respective effects of selected network types and extent of engagement in physical activity on depressive symptoms, controlling for physical health and sociodemographic background.

Results—The findings showed that physical activity was correlated inversely with late life depressive symptoms. However, when interaction terms for the selected social network types and the extent of physical activity were also considered, the main effect of social network on depressive symptoms increased, while that of physical activity was eliminated.

Conclusions—The results show that older American adults embedded in family network types are at risk of limited physical activity. However, interventions aimed to increase their engagement in physical activity might help to reduce depressive symptoms within this group.

Keywords

exercise; mobility; older adults; network type; American; NSHAP

Introduction

Depressive symptoms in late life are related to many factors. They may be the result of major life course events and/or the effects of cumulative lifelong adversity. Both of these pathways may be related to one's sociodemographic background and/or to one's health status, as well as to the interplay between background and health. Social networks are another important factor related to late life depression. Social ties can be supportive and can thus buffer the stress of adverse life events, countering the onset of depressive symptoms or mitigating their negative effect. However, social ties can themselves be the source of stress and may, in turn, contribute to poorer mental state.

A somewhat less explored area in relation to depressive symptoms is the area of physical activity in late life. Proponents of physical activity maintain that exercise is good for older people physically, and they see such activity as also promoting good mental health. In contrast, there are those who hold that one's proclivity to engage in physical activity is a concomitant of having good mental health. Stated otherwise, this suggests that older people who are depressed are less likely to engage in sport or exercise.

The current analysis examines the role of physical activity vis a vis depressive symptoms in light of social networks, controlling for the effects of background and health factors. The study draws upon data from a national sample of older Americans that uniquely provides information on physical activity, social network and depressive symptoms, as well as on background characteristics and a wide range of health factors, including mobility limitations and other health deficits that might variously affect activity, network and mental state. As such, the present study seeks to clarify the degree to which physical activity uniquely relates to depressive symptoms, beyond the effects of other key factors.

Literature Review

Research has established the positive association between physical activity and mental health among older persons (Penedo & Dahn, 2005; Stathi, Fox, & McKenna, 2002). Physically active people tend to function better than those who are inactive and they generally have a better mental state (Laukkanen, Kauppinen, & Heikkinen, 1998; McAuley & Rudolph, 1995; Taaffe, et al., 2008). Moreover, physical activity in late life has been shown to be related specifically to depressive symptoms. For example, an Italian study revealed that lower rates of physical activity were associated with a greater extent of depression (Marcellini, et al., 2010). Another study of a slightly younger cohort, based upon data from the American Health and Retirement Study (HRS), found that a decrease from vigorous physical activity status was associated with increased odds for depressive symptoms among the women (but not among the men), as measured on the eight-item version of the Center for Epidemiologic Studies Depression Scale (Carroll, Blanck, Serdula, & Brown, 2010). On the other hand, a study of older Finnish people found evidence for the reverse association, namely, that depressive symptoms increased the risk of physical inactivity (Rosqvist, et al., 2009).

A study of persons aged 65 and older in King County, Washington, revealed that neighborhood walkability (defined as walking at least 150 minutes per week in the neighborhood) had a protective association with depressive symptoms among the men, but not among the women (Berke, Gottlieb, Moudon, & Larson, 2007). A Finnish longitudinal study examined the association of both physical activity and mobility (delineated as the ability to walk two kilometers and climb one flight of stairs) with depressive symptoms in late life (Lampinen & Heikkinen, 2003). The follow-up interviews revealed that mobility problems increased the risk for developing depressive symptoms, but the level of physical activity did not. Finally, an analysis of data from the Established Populations for Epidemiologic Studies of the Elderly, in East Boston, Iowa and New Haven, demonstrated that depression increased the risk for incident disability in activities of daily living and mobility among respondents, but also that part of the excess risk was explained by decreased physical activity (Penninx, Leveille, Ferrucci, van Eijk, & Guralnik, 1999).

Research has also confirmed the relationship between social network ties and positive mental state in the older population. That is, people who are more socially connected tend to report greater emotional well-being than those who have fewer social ties (Litwin & Shiovitz-Ezra, 2011b). Specifically, Litwin (2011) found that older Americans embedded in more endowed social network types as defined by the extent of social capital at their disposal, namely the “diverse,” “friend” and “congregant” network types, reported less presence of depressive symptoms, to varying degrees. Those in the less resourceful networks—the “family” and “restricted” types—reported more such symptoms. However, recent research indicates that social networks can also be the source of negative interactions and that disagreeable relationships may be detrimental to one’s mental state (Antonucci, Akiyama, & Lansford, 1998; Birditt, Jackey, & Antonucci, 2009; Ingersoll Dayton, Morgan, & Antonucci, 1997).

Study has also provided support for an association between social ties and physical activity. There is evidence that persons with stronger social networks are more physically active and, correspondingly, those who are more physically active have stronger social networks (Chogahara, Cousins, & Wankel, 1998; Hawkey, Thisted, & Cacioppo, 2009; Litwin, 2003). Research has also shown that lack of social connectedness is associated with lesser physical engagement. For example, a study of residents of sheltered housing in three such facilities in Harlow, England, revealed that residents embedded in a limited social network, in terms of the social ties available, were more likely than those located in a more gregarious social network type to have significant activity limitation, as well as greater loneliness (Field, Walker, & Orrell, 2002). Analysis of a sample of American men and women age 50–68, from the Chicago Health, Aging, and Social Relations Study, found that loneliness predicted reduced physical activity and greater likelihood of becoming inactive (Hawkey, et al., 2009).

Physical health and health-related factors have been shown to correlate with depression. That is, better health and physical functioning are negatively associated with the number of depressive symptoms (Fischer, Wei, Solberg, Rush, & Heinrich, 2003; Henderson, et al., 1997; Roll & Litwin, 2010; Wu, Chi, Plassman, & Guo, 2010). However, consideration of the association between obesity and depressive symptoms raises some inconsistent findings. A Canadian study found that higher body mass index was associated with less physical activity and with a more severe form of depression—but to a lesser degree among women (Dragan & Akhtar-Danesh, 2007). It should not be overlooked, however, that severe depression may result in less weight gain. In comparison, the HRS study that was mentioned previously found that maintenance of obese status was associated with increased odds for depressive symptoms among the women, but not among the men (Carroll, et al., 2010).

Physical health and health-related factors have also been shown to correlate with physical activity. For example, a study of community-dwelling adults aged 75–81 years in Finland found that persons who were severely limited in their mobility reported poor health as a barrier to exercise more frequently than those with no mobility limitation (Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2007). Data from the Canadian Community Health Survey showed that persons aged 65 and older with chronic conditions were less likely to engage in leisure-time physical activities (Sawatzky, Liu-Ambrose, Miller, & Marra, 2007). Shah and others found an association between musculoskeletal pain and incident mobility disability (Shah, et al., 2011).

Finally, it should be noted that depressive symptoms in late life are associated with sociodemographic factors (Back & Lee, 2011; Lee & Shinkai, 2005; Zivin, et al., 2010). Specifically, depressive symptoms are found more frequently among older-old people, women, and those with less education and lower incomes. These same factors are related to social network (Litwin & Shiovitz-Ezra, 2011a), and to physical activity (Kaplan, Newsom, McFarland, & Lu, 2001; Lee & Levy, 2011; Ruchlin & Lachs, 1999; Strath, Swartz, & Cashin, 2009). Consequently, these variables need to be taken into account as well.

Based upon the preceding review, the study that is reported in this article attempts to clarify the nature of the associations that exist between physical activity and depressive symptoms, taking into account the effect of social network type as well. It examines the hypothesis that physical activity is negatively related to depressive symptoms, above and beyond the effects of social network type, health and sociodemographic background. It also examines the relative strength of the respective associations between physical activity and social network type, on the one hand, and the depression outcome, on the other hand.

Method

This inquiry was based upon data from the first wave of the National Social Life, Health and Aging Project, collected in 2005/2006. NSHAP is a nationally-representative probability household sample of community-dwelling individuals, aged 57–85, in the United States. The present analysis considered the sub-sample of persons aged 65 and older within the sample, in order to focus exclusively on the older cohort. The survey consisted of two main instruments—an in-home computer-assisted personal interview (CAPI) conducted in English or Spanish and a self-administrated post-interview questionnaire.

African-Americans, Latinos, men and the older age group were over-sampled in this survey, in order to guarantee their sufficient representation (O’Muircheartaigh, Eckman, & Smith, 2009). Sample weights were computed to adjust for non-response by age and urbanicity. The resultant weighted analytic sample in the current inquiry numbered 1,349 respondents. Thirty nine percent of the respondents were age 75–85, slightly more than half were women, and some 8 percent were Blacks (Table 1).

Variables

The sociodemographic control variables in the present analysis included age, gender, race, education and income. Age was categorized by two groupings: 65–74 (the young-old) and 75–85 (the older-old). Gender and race were addressed by dichotomous variables (women=1, men=0; Black=1, non-Black=0). Education was considered according to four levels of schooling: 1) less than high school, 2) high school or equivalent, 3) vocational education or some college and 4) bachelor’s degree or more. Income was based upon a probe that asked “Compared with American families in general, would you say that your household income is 1) far below average, 2) below average, 3) average, 4) above average, or 5) far above average?”

Health status was measured on two subjective indicators. Self-rated health was tapped on a 5-point scale that ranged from poor (1) to excellent (5). Comparative health status was obtained on a 5-point scale by means of the question: Compared with other people your age, would you say your health is much better, somewhat better, about the same, somewhat worse, or much worse? A series of specific indicators was also included in order to more directly address health-related mobility restrictions. These included mobility limitations, pain walking, obesity, eyesight and hearing.

Mobility limitations were measured by means of a 3-item scale that queried the extent of difficulty encountered in walking one block, walking across a room and getting in or out of bed. The scores for each probe ranged from 0–no difficulty, to 3–unable to do. The total mobility scale score ranged from 0–9 ($\alpha=.72$), the higher the score, the greater the limitation. A corresponding measure of pain while walking was reflected in a yes/no response to the following probe: “During the past 12 months have you had pain, aching, or cramps in your calves, thighs, or buttocks that occurred while walking, but improved with rest?”

Obesity was measured by means of interviewer assessment. Each respondent was ranked on a scale that ranged from 1–thin to 5–obese. Subsequent analysis showed that interviewer assessment of body shape was highly correlated with a corresponding indicator of body mass index, divided into quintiles ($R=.74$). Use of the interviewer assessment of body shape was preferred over the BMI measure due to missing data on the latter variable, which would have caused the loss of a greater number of cases in the multivariate part of the analysis. For the purposes of the current analysis, the assessment score was dichotomized, such that a high score (4–5) was considered as obese (the corresponding BMI mean for this group was

34.8, SD=5.9). Finally, eyesight and hearing were each ranked by respondents on 5-point scales that ranged from poor to excellent. These rankings were included in the analysis insofar as deficits in these particular sensory functions might limit the willingness of older people to leave their domiciles.

Social network was measured through a typology of social networks among American adults that was constructed by means of cluster analysis using key network criterion variables. The methodology of the derivation process is explained in greater detail elsewhere (Litwin & Shiovitz-Ezra, 2011b). For the purpose of the current analysis, it is sufficient to note that the network types were derived based upon respondents' marital status, number of children, number of close relatives, number of friends, frequency of getting together with neighbors, frequency of attendance at religious services and frequency of attendance at organized group meetings. The clustering process produced five different network types. Three of the network types, named "diverse," "friend," and "congregant" networks, were more resourceful, to varying degrees, in terms of their social capital. That is, they had more social ties or a greater diversity of ties. Two other network types were less resourceful in this respect.

The current analysis focuses on these two latter network types, named "family" and "restricted" networks, because they reflect networks that are under-endowed in terms of social ties, that is, their network members are fewer or come from a more narrow range of sources. Hence, persons embedded in these particular network types are at-risk of social isolation and its concomitants. Specifically, the family network type has a comparatively high number of children, on average, but it scores low on most other kinds of ties, particularly those of a non-familial nature. The restricted network has the fewest life partners, the fewest children and close relatives, the least attendance at a place of worship, and only average contact with friends, neighbors and group meetings. Membership in either of these two networks was addressed in the current analysis by means of two dichotomous variables—family network (0,1) and restricted network (0,1), respectively.

The extent of respondents' engagement in physical activity was addressed by means of a score on a probe which asked "How often do you participate in physical activity such as walking, dancing, gardening, physical exercise or sports?" The scores on this variable were 0) never, 1) less than 1 time per month, 2) 1–3 times per month, 3) 1–2 times per week, and 4) 3 or more times per week.

The outcome measure in the present inquiry was an indicator of depressive symptoms experienced during the past week. The analysis utilized the 8-item version of the Center for Epidemiological Studies Depression Scale (CES-D). The eight items employed were: I felt depressed, I felt that everything I did was an effort, my sleep was restless, I was happy (reverse item), I felt lonely, I enjoyed life (reverse item), I felt sad and I could not get "going." The probe queried the extent of these feelings on a scale that ranged from rarely or none of the time (0), to most of the time (3). The total scale thus ranged from 0–24 ($\alpha=.76$).

Analysis

The analysis was executed at univariate, bivariate and multivariate levels. The univariate level presents the variable descriptions. A bivariate correlation matrix examined the associations between all the study variables. The multivariate phase was based upon hierarchical linear regressions that examined five successive models. In the first model, depressive symptoms were regressed on the sociodemographic control variables. The second model added the health and health-related indicators to the model. In the third model, the effect of embeddedness in either of the two network types of interest—family or restricted networks—was considered beyond the effect of the control measures. The fourth model

regressed the number of depressive symptoms on the frequency of engaging in physical activity, in addition to all the variables considered thus far. The final stage of the analysis repeated this last procedure, taking into account the interactions between the selected network types and physical activity as well.

Results

As noted earlier, respondents aged 75–85 comprised over a third of the analytic sample, women were more than half, and Blacks less than a tenth (Table 1). Average educational level was higher than high school. In terms of income, respondents felt that they had a bit lower than average household incomes compared with American families in general. Average self-rated health was good and respondents viewed their health as somewhat better than that of other people their age. Mobility limitations were quite low, but more than a third experienced pain while walking. Almost a quarter was considerably overweight. Respondents reported their eyesight as between good and very good, on average, and rated their hearing as good. Over a third of the sample was embedded in networks at-risk: about 14 percent in family networks and about 24 percent in restricted networks. Reported physical activity was relatively high in this sample—3 or more times per week on average. As for the number of depressive symptoms, the average score was low (about 4.5 out of 24), but over a quarter of the sample was above the cut-off point for suspected depression (Litwin, 2011).

The matrix in Table 2 shows the bivariate correlations between the study variables. The table shows that depressive symptoms were related to all of the measures in the study except for race. Physical activity was related to all the study variables except for age and embeddedness in a restricted network type. Belonging to the family network type was related to all the control variables, except for age, race, comparative health and hearing. In contrast, belonging to the restricted network type was related (inversely) only to three of the control variables: female gender, race and obesity.

The results of the first stage of the hierarchical regression analysis are reported in Table 3 in the column headed by Model 1. The numbers show that income, education and gender were all related to depressive symptoms, and age was marginally related when background factors only were considered. The sociodemographic background variables accounted for about 6 percent of the variance in the outcome measure. However, when health and health-related variables were added in Model 2, these associations generally weakened (income) or disappeared (education). In contrast, the association of gender, in comparison, was strengthened a bit. The model also shows that all of the health and health-related variables were associated with the number of depressive symptoms, except for obesity, and they accounted for an additional 16 percent of the explained variance in the outcome measure.

The entry of the network type variables is reported in Model 3. The results show that restricted network types were related at this stage of the analysis to depressive symptoms, all things considered, but family type networks were not. The addition of the network types to the analytical model increased the explained variance in the outcome measure by one percent only. Physical activity was entered in Model 4. Although the overall explained variance in this round was unchanged from that found in the previous round, and the strength of the other associations remained more or less the same, frequency of engagement in physical activity emerged as a significant negative correlate of depressive symptoms.

The final round of the procedure, presented in Model 5, shows the results of the same regression with the addition of the interaction terms between network type and physical activity. The interactions did not essentially change the associations between the control and

health-related variables, on the one hand, and the number of depressive symptoms, on the other, nor did they strengthen the model overall. However, their entry increased the main effects of the network type variables on the depression outcome; both of which became positive and significant. Moreover, the interactions eliminated the main effect of physical activity on depressive symptoms. In addition, the interaction of family type network $\times$ physical activity presented a borderline negative association with the depressive symptoms outcome measure, all else considered. It should be pointed out that the unique effect of the interaction terms was minimal. A separate analysis (not shown) in which depressive symptoms were regressed exclusively on network type, physical activity and the interaction terms confirmed that the effect size of the latter was small (Cohen's $f^2 = .01$).

Discussion

This study of older American adults sought to clarify whether physical activity is independently associated with mental health, above and beyond the effects of social network relationships. The bivariate study results reinforced the notion that physical activity in late life is a concomitant of good physical health. They also supported the known association between education and engagement in physical activity (Shaw & Spokane, 2008). In addition, older women and Blacks were found to be less likely to engage in physical activity. The bivariate analysis also showed that respondents who were embedded in family type networks engaged less in physical activity. These results suggested, initially, that members of the family network type might not tend to encourage involvement in such health-promoting behavior.

As for the multivariate testing of the hypothesis, the findings from the analysis partly confirmed the assumption. That is, physical activity did, indeed, emerge in one stage of the multivariate procedure as a negative correlate of late life depression after controlling for sociodemographic background, health and social network type. However, the addition of interaction terms between physical activity and the two network types changed this picture somewhat. First, they strengthened the positive correlations between the two social network type measures and depressive symptoms and, second, they eliminated the effect of physical activity on the depression outcome.

Moreover, the results indicated that the family network type maintained a positive association in relation to depressive-symptoms. That is, members of this network grouping reported more depressive symptoms. At the same time, a marginally significant negative association was evident with the family network/physical activity interaction term. This suggests that even within this socially limited network grouping, physical activity may have been protective against depression for some. Given its marginal significance in the current analysis and the small effect size, however, this interesting potential finding requires further corroboration.

The same can not be said in relation to the other socially limited network type that was considered in the present inquiry—the restricted network type. The study findings showed first, in the bivariate analysis, that embeddedness in restricted networks was not related to frequency of engagement in physical activity. Second, embeddedness in restricted networks was found consistently in the multivariate procedure to be positively associated with depressive symptoms, even after considering the effect of physical activity. Finally, engagement in physical activity by respondents in restricted networks did not seem to mitigate this association, as reflected in the interaction term. This is an important finding to consider because, as noted, almost a quarter of older Americans are located in this socially limited network type.

It is also instructive to consider the associations that were observed between the health variables, on the one hand, and the frequency of engagement in physical activity and the number of depressive symptoms, on the other hand. As noted earlier, physical activity was related to all of the health variables at the bivariate level—positively with health status indicators and negatively with measures of health limitations. Correspondingly, it was found in the multivariate analysis that almost all of the health variables were related to the number of depressive symptoms—negatively in the case of the health status indicators and positively in the case of the health limitations variables (except for obesity). It seems, therefore that better health is related to both greater physical activity and to better mental state (fewer depressive symptoms).

As for the sociodemographic characteristics, the findings in the present study reinforce the established trends that lower income and female gender are correlates of depressive symptoms in late life. They also point to the fact that, after controlling for a wide range of background and health variables, there is no effect of chronological age in relation to both physical activity and the depression outcome. That is, age *per se* neither restricts physical activity nor does it increase depressive symptoms.

A few limitations of the present study need to be recognized. First, this was a cross-sectional analysis. As such, it was not possible to examine causality. It seems that network types are related to both physical activity and depressive symptoms. But it could also be that depressive symptoms reduce one's willingness to engage in physical activity, or that they distance social ties so that one is left with a restricted social network only. In order to confirm the directions of the relationships which were hypothesized in the current analysis, longitudinal data is required. This will be possible in the future, after data from the second wave of NSHAP are released for public use. A second limitation in the current sample might be the scores on the physical activity indicator, which were a bit high. Further research should address more specific indicators of physical activity, including performance measures.

The current analysis has value, nevertheless, in that it makes use of a unique data set that allows the simultaneous consideration of sociodemographic background characteristics, social network type, physical activity and depressive symptoms in a national sample of older Americans. This distinctive database made it possible to examine and to better understand the possible effects of social network type and the frequency of engagement in physical activity on depressive symptoms in late-life.

The findings also suggest that in some cases, particularly among older Americans who are embedded in family network types, purposive interventions that increase the propensity to engage in physical activity might, in turn, reduce depressive symptoms. Studies indicate that training programs can have positive results, such as improved walk endurance capacity (MacRae, et al., 1996), and can protect against further mobility loss (Simonsick, Guralnik, Volpato, Balfour, & Fried, 2005). Moreover, controlled trials have shown that physical activity counseling may reduce depression among those with initial minor depressive symptoms (Pakkala, et al., 2008). A study in New Zealand demonstrated, for example, that individualized physical activity programs improved quality of life among older people with depressive symptoms as much as social visits did (Kerse, et al., 2010).

In conclusion, the association between physical activity and emotional well-being in late life does indeed reflect a complex interplay of several factors. A key factor, in this regard, is the social network in which older people are embedded. Special attention should be given to those who are enmeshed in socially-limited network constellations, such as the family and restricted network types that were addressed in this analysis. By taking one's social network

into account, trainers and program planners should be able to more effectively target persons for whom physical activity promotion programs may be protective against late-life depression.

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Table 1

Background, health, mobility, selected network type, physical activity and depressive symptoms among Americans aged 65–85: Univariate descriptions

Variable	N	%	Mean	SD	Range	Total
Age 75–85	526	39.0				1,349
Women	735	54.5				1,349
Blacks	102	7.6				1,349
Education			2.55	1.03	1–4	1,349
Income			2.84	0.88	1–5	1,314
Self-rated health			3.29	1.09	1–5	1,344
Comparative health			3.87	0.96	1–5	1,335
Mobility limitations			0.71	1.43	0–9	1,349
Pain walking	503	37.8				1,330
Obesity	312	23.2				1,346
Eyesight			3.54	1.02	1–5	1,347
Hearing			3.32	1.07	1–5	1,348
Family network	187	13.9				1,349
Restricted network	319	23.6				1,349
Physical activity			3.19	1.32	0–4	1,347
Depressive symptoms			4.54	4.11	0–24	1,343

Table 2
Correlation matrix of the bivariate associations among the study variables; Pearson coefficients

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1) Age 75-85	---														
2) Women	.05	---													
3) Blacks	-.08**	.01	---												
4) Education	-.09**	-.12***	-.13***	---											
5) Income	-.07**	-.16***	-.12***	.45***	---										
6) SRH	-.09**	.02	-.09**	.22***	.24***	---									
7) Comparative health	.01	-.01	-.02	.12***	.20***	.56***	---								
8) Mobility Limitations	.11***	.10***	.02	-.21***	-.20***	-.43***	-.39***	---							
9) Pain walking	.02	.02	.07*	-.22***	-.11***	-.27***	-.20***	.27***	---						
10) Obesity	-.03	.01	.04	-.05	-.07*	-.18***	-.20***	.24***	.15***	---					
11) Eyesight	-.07*	-.02	-.13***	.24***	.22***	.40***	.25***	-.27***	-.14***	-.040	---				
12) Hearing	-.13***	.15***	.04	.10***	.06*	.25***	.15***	-.14***	-.10***	.022	.28***	---			
13) Family network	-.03	-.06*	.02	-.10***	-.07*	-.07*	-.03	.14***	.06*	.09**	-.08**	-.03	---		
14) Restricted network	-.00	-.07*	-.07**	.02	.00	.00	-.04	.05	-.05	-.07*	-.01	.04	-.22***	---	
15) Physical activity	-.05	-.13***	-.08**	.19***	.19***	.36***	.36***	-.50***	-.16***	-.17***	.20***	.10***	-.12***	-.02	---
16) CESD-8	.07**	.11***	.00	-.19***	-.20***	-.38***	-.30***	.31***	.24***	.07**	-.28***	-.18***	.06*	.07**	-.30***

*
p < .05;

**
p < .01;

p < .001

Table 3

Variables associated with depressive symptoms: Hierarchical OLS regressions (N=1,275)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	β	β	β	β	β
Age 75–85	.05+	.01	.02	.02	.02
Women	.06*	.08***	.09***	.08***	.08***
Blacks	-.02	-.04	-.04	-.04	-.04
Education	-.11**	-.02	-.01	-.01	-.01
Income	-.15***	-.07*	-.07*	-.06*	-.06*
Self-rated health	--	-.18***	-.18***	-.18***	-.18***
Comparative health	--	-.08*	-.08*	-.06*	-.06*
Mobility limitations	--	.13***	.12***	.08***	.08*
Pain walking	--	.11***	.11***	.12***	.11***
Obesity	--	-.02	-.02	-.02	-.02
Eyesight	--	-.11***	-.11***	-.11***	-.11***
Hearing	--	-.06*	-.07*	-.07*	-.07**
Family network	--	--	.03	.02	.12*
Restricted network	--	--	.08**	.08**	.16*
Physical activity	--	--	--	-.11***	-.06
Interaction terms:					
Family network X physical activity	--	--	--	--	-.11 ⁺
Restricted network X physical activity	--	--	--	--	-.09
Adjusted R ²	.06	.22	.23	.23	.23
F	16.54***	30.99***	27.42***	26.69***	23.83***

⁺ .05 > p < .06;

* p < .05;

** p < .01;

*** p < .001