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Contributors to mental health resilience in middle-aged and older adults: an analysis of the Canadian Longitudinal Study on Aging

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ABSTRACT

Objectives: Identifying the correlates of mental health resilience (MHR)—defined as the discrepancy between one's reported current mental health and one's predicted mental health based on their physical performance—may lead to strategies to alleviate the burden of poor mental health in aging adults. Socioeconomic factors, such as income and education, may promote MHR via modifiable factors, such as physical activity and social networks.

Design: A cross-sectional study was conducted. Multivariable generalized additive models characterized the associations between socioeconomic and modifiable factors with MHR.

Setting: Data were taken from the population-based Canadian Longitudinal Study on Aging (CLSA), which collected data at various data collection sites across Canada.

Participants: Approximately 31,000 women and men between the ages of 45 and 85 years from the comprehensive cohort of the CLSA.

Measurements: Depressive symptoms were assessed by the Center for Epidemiological Studies Depression Scale. Physical performance was measured objectively using a composite of grip strength, sit-to-stand, and balance performance. Socioeconomic and modifiable factors were measured by self-report questionnaires.

Results: Household income, and to a lesser extent, education were associated with greater MHR. Individuals reporting more physical activity and larger social networks had greater MHR. Physical activity accounted for 6% (95% CI: 4 to 11%) and social network accounted for 16% (95% CI: 11 to 23%) of the association between household income and MHR.

Conclusions: The burden of poor mental health in aging adults may be alleviated through targeted interventions involving physical activity and social connectedness for individuals with lower socioeconomic resources.

Key words: mental health resilience, CLSA, socioeconomic factors, social network, physical activity

Introduction

In 2020, 6.3% of older adults over the age of 65 years reported living with a mood disorder (Government of Canada, 2021), though it is presumed that the actual prevalence is higher as mood disorders are commonly underreported and misdiagnosed in older adults (Lyness *et al.*, 1995). Mood disorders, such as depression, are associated with multiple negative outcomes including cognitive decline, reduced mobility, suicidality, and premature mortality (Valiengo *et al.*, 2016). Due to the growing population of older adults worldwide, the prevalence of mood disorders is increasing; therefore, the need to understand and support the mental health of older adults has become an increasing public health priority (Valiengo *et al.*, 2016).

Ample research has examined correlates of mental health in older adults (Rodda *et al.*, 2011;

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Wang *et al.*, 2018). In particular, there has been substantial attention on the role of socioeconomic position (SEP) in health outcomes (Marmot, 2005), and specifically in depression (Lorant *et al.*, 2003). Individuals with higher income (Mumba *et al.*, 2021) and higher education levels (Lee, 2011) tend to report lower levels of depression. As SEP is not easily modifiable, research has focused on potentially modifiable contributors to mental health. For example, the role of individual resources in older adults' mental health has been examined, with findings showing associations between greater social support and lower mental distress (Cosco *et al.*, 2019), and greater mental health (Fasihi Harandi *et al.*, 2017). Additionally, in a sample of older adults, moderate to vigorous physical activity was associated with increased mental well-being (Mumba *et al.*, 2021).

One way older adults have been found to maintain mental well-being despite age-related declines is through fostering greater resilience (Cosco *et al.*, 2017a; MacLeod *et al.*, 2016). Resilience refers to positive adaptation when faced with adversity (Cosco *et al.*, 2018a), or in other words 'bouncing back' from adversity (Windle, 2011). For instance, an individual demonstrating resilience will have an outcome greater than expected (i.e. maintain high levels of functioning) in light of the level of adversity they experience (Cosco *et al.*, 2017a). This use of the term resilience describes resilience as a state, or a dynamic process, rather than a static trait throughout the lifespan (Kuldas and Foody, 2022). Most resilience research has focused on children and adolescents, but more recent literature has begun to describe key issues surrounding resilience in mid-life and older populations (Ong *et al.*, 2009). For example, some researchers have integrated resilience into the model of successful aging, finding that individuals who age successfully show patterns of resilience throughout their lives (Pruchno *et al.*, 2015). Further, Wister *et al.*s' (2016) Lifecourse Model of Multimorbidity Resilience highlights the role of individual, social, and environmental resources in successfully overcoming adversity. Their model describes the complex interconnectedness between resources and provides a theoretical starting point to investigate the interactions between them (Wister *et al.*, 2016). Previous research suggests that older adults can exhibit high resilience despite a low SEP (MacLeod *et al.*, 2016). Some key characteristics of resilient older adults that may be modifiable, even at an older age, include community involvement, social support, and being physically active (MacLeod *et al.*, 2016).

Resilience has been conceptualized and operationalized in many ways as various measures of adversity and adaptation have been used in past literature (Cosco *et al.*, 2017b). A key feature of the conceptual model of resilience is some form of adversity, and this can be from a variety of domains, for example, physical or psychological, and a positive response to this adversity, which can also be from a variety of domains (Cosco *et al.*, 2017a). Within these adversity–outcome dyads, there are many different forms of resilience that can be observed. The "residual" approach to measuring resilience compares individuals' actual adjustment score to their predicted adjustment score based on the level of adversity (Miller-Lewis *et al.*, 2013). Individuals with positive residual scores demonstrate resilience, with the size of the residual quantifying their level of resilience. This approach was initially used in studies of early childhood (Miller-Lewis *et al.*, 2013) but has recently been employed in aging research, for example, amongst older adults, a measure of physical capability has been used to quantify adversity, while a measure of well-being has been used to quantify adaptation (Cosco *et al.*, 2018b).

Despite the robust evidence describing correlates of mental health, and the novel literature on resilience among older adults, presently, there is a lack of research focused on older adults' mental health resilience (MHR), especially in Canadian samples. A recent study done in the UK by Cosco *et al.* (2019) found that individual factors (i.e. leisure time physical activity and social support) were positively associated with resilience in older adults. Building on these findings, the current study aimed to examine the contributors to MHR in a large, representative Canadian sample of middle- and older-aged adults, with a specific focus the role of SEP and individual resources.

The objectives of the present study are 1) to determine if individual SEP is related to MHR 2) to determine if individual resources (i.e. social network, physical activity) relate to MHR, beyond SEP and environment, and 3) to examine the mediating effect of individual resources on the association between individual SEP and MHR. It is hypothesized that SEP and individual resources will be positively associated with greater MHR. Additionally, it is hypothesized that individual resources will mediate the relationship between SEP and MHR.

Methods

Participants

The Canadian Longitudinal Study on Aging (CLSA) is a national Canadian study of participants aged 45 to 85 years when recruited and is comprised of two cohorts. For the current study, only the "Comprehensive" cohort was included because they completed the required in-person physical

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performance assessment. The Comprehensive cohort was formed by randomly selecting within age/sex strata among the population residing within 25 km of a data collection site (or 50 km in a lower population density area). Persons excluded included those living in institutions at the baseline, full-time members of the Canadian Armed Forces, persons living on federal First Nations reserves and other First Nations settlements, the three northern territories and some remote regions, those unable to respond in English or French, and those with cognitive impairment at baseline. The baseline data were collected from 30,097 participants in the Comprehensive cohort between 2011 and 2015. Baseline data for the comprehensive cohort were collected through both an in-home interview and an in-depth physical assessment at a data collection site. Ethical review of the CLSA protocol was conducted by the Ethical, Legal, and Social Issues Committee, falling under the jurisdiction of the Canadian Institutes of Health Research (CIHR), and research ethics board approval was then acquired from each research site. The Simon Fraser University REB approved the analyses presented here. Additional information about the CLSA is available elsewhere (Raina *et al.*, 2009).

Measures

Depressive symptoms

Depressive symptoms in the CLSA were measured with the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977), which contains 10 questions on feelings of depression, loneliness, hopefulness for the future, and restless sleep. Responses range from "all of the time" to "rarely or never," with a total score between 0 and 30.

Physical performance

Maximum hand grip strength of the dominant hand, total time to complete five consecutive sit-to-stand movements, and best standing balance time on one foot were collected. A composite physical performance score was calculated from these measures using the method proposed by Guralnik and colleagues (Guralnik *et al.*, 2006). This involved (1) adjusting grip strength by the person's body size (as indicated by the person's standing height); (2) rescaling all three measures to a 0–1 scaling, such that a score of 1 is equivalent to the score at the 99th percentile of the distribution, adjusted for age and sex; (3) recoding scores above 1 (as would occur for those individuals above the 99th percentile) to a value of 1; and (4) summing these three rescaled scores.

Chronic conditions

The number of chronic conditions (using the prompt: "Has a doctor ever told you that you have X") were counted if they were among the following disease categories: musculoskeletal, respiratory, cardiovascular, endocrine-metabolic, neurological, gastrointestinal, genitourinary, ophthalmologic, renal, and cancer.

Socioeconomic position

Self-reported education level and household income were included to characterize socioeconomic position.

Physical activity

Self-reported physical activity was assessed using the Physical Activity for the Elderly (PASE) scale (Washburn *et al.*, 1993). Participants respond with the number of days per week and number of hours per day to 19 items regarding different categories of leisure PA. A summary PA score is computed from weights and frequency values for each of the PA categories.

Structural social network

The five domains of the structural, objective component of the Social Isolation Index (Wister *et al.*, 2019) were summed to quantify participants' structural social network. Domain 1 assesses frequency of community and social participation over the past 12 months; domain 2 assesses the number of network members in eight distinct network nodes (e.g. friends, neighbors, family members, community involvement); domain 3 assesses the recency of visits with individuals outside of the household; domain 4 entails one's living arrangement (i.e. living alone or not alone); and domain 5 consists of one's marital status.

Statistical analysis

All data manipulation and statistical analysis were conducted in R version 4.1.2. The primary analytic framework employed generalized additive models (GAMs) using the R package "mgcv" (version 1.8-38). GAMs are an extension of the generalized linear model and allow for nonlinearities in the associations between continuous exposure variables (or covariates) with the outcomes of interest; such nonlinearities are modeled using smooth, nonparametric functions (Hastie and Tibshirani, 1986). In the current study, these smooth functions entailed penalized cubic splines with three knots (located at the minimum, median, and maximum value of the covariate). GAMs were constructed in a stepwise fashion. In the first model, log-transformed total CES-D score was regressed on the composite physical performance measure. Standardized residual scores (mean = 0, standard deviation = 1) were extracted, calculated by subtracting the

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predicted CES-D score from the observed CES-D score. This standardized residual score—hereafter termed "depression vulnerability"—was used as the outcome in the subsequent models. The outcome measure of depression vulnerability represents the inverse of MHR, such that someone with greater depression vulnerability would have lower MHR and vice versa. The second model regressed depression vulnerability on participant age, sex, ethnicity (White versus non-White), the number of chronic conditions, study interview language (French or English), educational attainment, and household income. The third model added total PASE score and structural social network to all of the variables included in model 2. In presenting the results of these GAMs, binary predictors within are summarized with an estimate, standard error, and *t* test, as is done in linear regression analysis. For continuous predictors, an *F* test is calculated because the association between continuous measures and the outcome are modeled with a collection of smooth functions, rather than a single regression coefficient; the *F* test offers a test of the null hypothesis that the relationship between the continuous predictor and outcome is zero (Wood, 2017). A *P* value is calculated from each *F* value using the effective degrees of freedom, which reflect the degree to which the smooth terms are penalized to a simple linear association, and the residual degrees of freedom for the model. These degrees of freedom are reported along with the *F* values in the results below.

To quantify the degree to which individual socioeconomic factors might transmit their effects on depression vulnerability through physical activity or structural social network, mediation analyses were conducted using the R package "mediation" (version 4.5.0). Mediation models were fit using the same GAMs with cubic splines as was used in the models described above. Estimates of interest were the mediation effect, direct effect, total effect, and the proportion of the total effect mediated through the putative mediators. Nonparametric bootstrap confidence intervals using the percentile method, with 1000 bootstrap simulations, were constructed around the estimates of interest.

To evaluate whether the inferences drawn from the primary analyses might be influenced by item-level non-response bias, we repeated these analyses after imputing missing data. Missing data were multiply-imputed by chained equations with the R package "mice" (version 3.13.0). Forty data sets were imputed using predictive mean matching following 40 iterations of the algorithm; the quality of the imputed values was assured by evaluating the distribution of imputed values and examination of trace plots for proper mixing and absence of spikes in the iterations. Subsequent analyses were conducted on each of the imputed data sets with estimates then being pooled using Rubin's rule (Rubin, 1987) and degrees of freedom calculated using the Barnard–Rubin adjustment (Barnard and Rubin, 1999). Finally, we compared the results of the GAMs when using imputed data to listwise deletion of missing data.

Results

The mean age of participants in the analytic sample was 62 years. Just over half the sample was female (51%), and 96% of the sample identified their ethnicity as White. Participants had a mean depression score of 4 (IQR: 2–7, range 0–10). In terms of physical performance, participants had a mean score of 1.8 (IQR: 1.3–2.2, range 0–3). Additional participant characteristics are described in Table 1. Where applicable, the number of observations with missing data on a given variable is provided. Missingness was generally minimal (i.e. less than <5% missing) with notable exceptions of annual income, physical performance score, and physical activity score. As shown in Figure 1A, physical performance had a significant negative, curvilinear association with depressive symptoms (F [1.8, 26,343] = 203.83, $p < 0.001$, $R^2 = 1.6\%$). The resulting residuals from this model were normally distributed (Figure 1B).

The first multivariable model of depression vulnerability is summarized in the left-hand set of columns of Table 2. Accounting for the various covariates, household income and educational attainment had negative associations with depression vulnerability (F [1.9, 21,376] = 189.25, $p < 0.001$ and F [1, 21,376] = 10.02, $p = 0.002$, respectively); as shown in panels A and B of Figure 2, the association was stronger for household income than for educational attainment. Of interest, the association between household income and depression vulnerability appears to diminish somewhat across the highest income categories, whereas educational attainment was estimated to have an approximately linear association with depression vulnerability across the range of education.

The second multivariable model of depression vulnerability, which added physical activity and structural social network to the aforementioned model, is presented in the right-hand set of columns of Table 2. Physical activity had a negative association with depression vulnerability (F [1.9, 21,372] = 30.83, $p < .001$), which appeared to be strongest as reported physical activity increased from very low to moderate levels (Figure 2C). Structural social network also had a negative association with depression vulnerability (F [1.9, 21,372] = 97.02,

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Table 1. Sample characteristics ($n = 30,097$)

CHARACTERISTIC	MEDIAN (AND INTERQUARTILE RANGE) OR *N* (%)
Age, years	62 (54, 71)
Sex, female	15,320 (51%)
Ethnicity, White	28,771 (96%)
Interview in French	5,806 (19%)
Number of chronic conditions	2 (1, 3)
(Missing)	2,745
Annual household income	
Less than $20,000	1,566 (5.6%)
$20,000–$49,999	6,360 (23%)
$50,000–$99,999	9,907 (35%)
$100,000–$149,999	5,524 (20%)
$150,000 or more	4,799 (17%)
(Missing)	1,941
Educational attainment	7 (6, 9)
(Missing)	50
Physical performance	1.8 (1.3, 2.2)
(Missing)	3,665
Structural social network	4.4 (3.9, 4.9)
Physical activity	152 (104, 211)
(Missing)	2,042
Depressive symptoms	4 (2, 7)
(Missing)	161

$p < .001$), which was strongest for relatively high structural social network scores (Figure 2D).

Before conducting formal mediation analysis, the putative mediators—physical activity and structural social network—were regressed on the set of covariates, household income, and educational attainment. Household income was positively associated with physical activity (F [2, 21,376] = 75.30, $p < .001$; Supplemental Figure 1A) and with structural social network (F [2, 21,376] = 484.02, $p < .001$; Supplemental Figure 1C). In contrast, evidence for an association between educational attainment and physical activity (F [1.9, 21,376] = 11.54, $p < .001$; Supplemental Figure 1B) or structural social network ($F = 2.31$ [1.6, 21,376], $p = .18$; Supplemental Figure 1D) was weaker. The effects of interest from the mediation models are summarized in Table 3. Physical activity and social networks were both partial mediators of the association between income and depression vulnerability, such that physical activity accounted for 6% (95% CI: 4 to 11%) and structural social network accounted for 16% (95% CI: 11 to 23%) of the association between household income and depression vulnerability. As expected from the null findings above, there was limited evidence that the association between education and depression vulnerability was mediated by these variables (see Table 3 for details).

Estimates from the models using multiple imputation of missing data are presented in Supplemental Tables 1–2 and Supplemental Figures 2–4. The estimates are very similar to what is presented here, suggesting that participant nonresponse to these measures do not bias the inferences drawn above.

Discussion

In a large cohort of middle- and older-aged Canadian women and men, we find that SEP—specifically household income, and to a lesser degree, individual educational attainment—is associated with greater MHR, as defined by the discrepancy between one's reported depressive symptoms and one's predicted depressive symptoms according to their objective physical performance. Of note, we detected a degree of nonlinearity in the association between income levels and resilience, such that the association was strongest across the lower and middle values of income, and diminished somewhat across high values of income. Furthermore, we observed that modifiable individual resources—especially the extent of one's social network, and to a lesser degree, one's level of physical activity—may partially mediate the effects of SEP on MHR. These results would indicate that the impact of low SEP on MHR is explained, in part, by individual resources such as social network and physical activity. Therefore, individuals with low SEP may be able to foster MHR by increasing social connection and physical activity levels.

These findings largely confirm the results presented by Cosco *et al.* (2019), who found that current SEP, rather than childhood SEP, is associated with MHR among British adults aged 60–64 years. Cosco *et al.* (2019) measured social mobility by comparing childhood and current SEP, identifying upward, downward, and neutral SEP trajectories in order to examine the relationship between SEP trajectories and resilience. The authors observed that there was no indication of "steeling," i.e. experiencing adversity in early-life builds up the resources to deal with stressors in later life. Our results provide additional evidence that current SEP is an indicator of resilience in mid-life and older adults, highlighting the potential importance of proximal resources.

Physical activity has robust links to a host of positive physical and mental outcomes (McPhee *et al.*, 2016) and has also been linked with greater resilience (Cosco *et al.*, 2019; Perna *et al.*, 2012; Silverman and Deuster, 2014). In line with our results, Cosco *et al.* (2019) observed that physical activity in a UK sample might serve as a mediator of

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Table 2. Summary of generalized additive models with depression vulnerability as outcome

	MODEL 1			MODEL 2		
BINARY VARIABLES	UNSTANDARDIZED BETA (SE)	*t* VALUE (DF)	*p* VALUE	UNSTANDARDIZED BETA (SE)	*t* VALUE (DF)	*p* VALUE
Interview language, French	− 0.06 (0.02)	− 3.48 (21,376)	<0.001	− 0.07 (0.02)	− 4.36 (21,372)	<0.001
Sex, female	0.10 (0.01)	7.65 (21,376)	<0.001	0.10 (0.01)	7.28 (21,372)	<0.001
Ethnicity, white	0.01 (0.03)	0.27 (21,376)	0.79	0.04 (0.03)	1.10 (21,372)	0.27
CONTINUOUS VARIABLES		*F* VALUE (DF1, DF2)	*p* VALUE		*F* VALUE (DF1, DF2)	*p* VALUE
Age		389.96 (2, 21,376)	<0.001		339.65 (2, 21,372)	<0.001
Chronic conditions		276.98 (2, 21,376)	<0.001		253.97 (2, 21,372)	<0.001
Income		189.25 (1.9, 21,376)	<0.001		123.83 (1.9, 21,372)	<0.001
Education		10.02 (1, 21,376)	0.002		9.13 (1, 21,372)	0.003
Physical activity					30.83 (1.9, 21,372)	<0.001
Social network					97.02 (1.9, 21,372)	<0.001

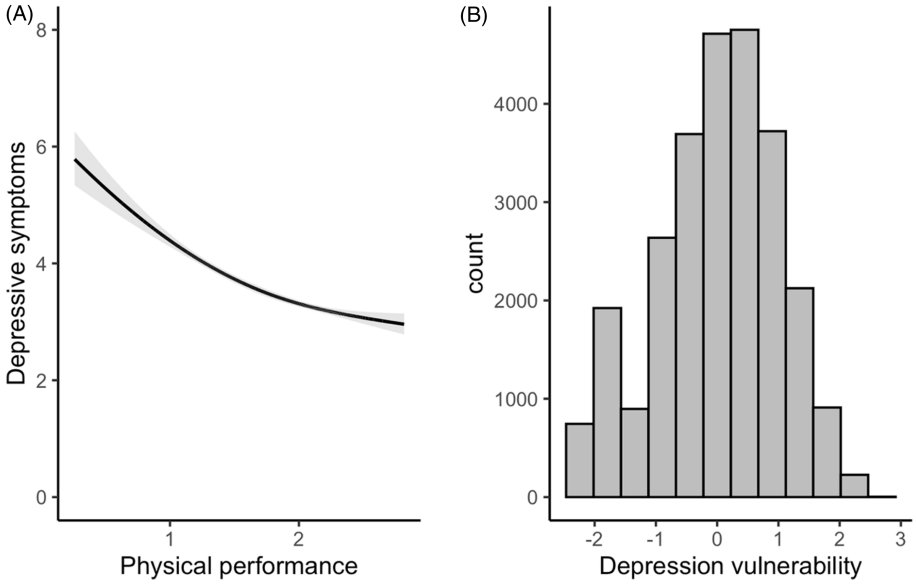

Figure 1. Predicted average depressive symptoms over distribution of physical performance scores (panel A) and distribution of standardized residuals after regression of depressive symptoms on physical performance (panel B). *Note.* Shading in panel A reflects 95% confidence interval.

the association between SEP and resilience. This mediation effect may be caused by physical activity's ability to serve as a stress resistance resource (Silverman and Deuster, 2014), potentially enhancing one's ability to cope with SEP-related stressors.

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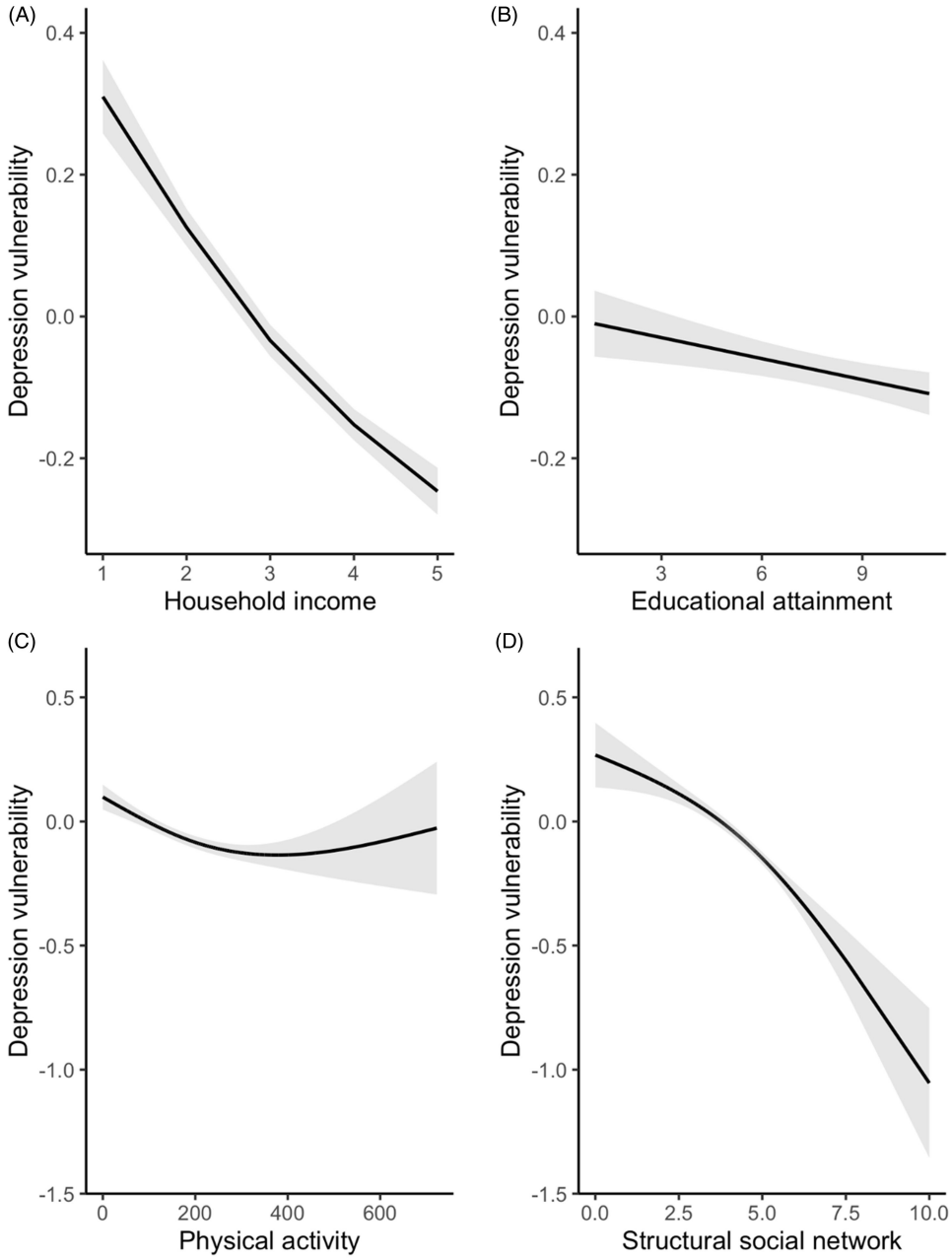

Figure 2. Predicted average depressive vulnerability over distribution of household income (panel A), educational attainment (panel B), physical activity (panel C), and structural social network (panel D).

In contrast to the current findings, work by Cosco *et al.* (2019) did not observe a mediation effect of one's structural social network. This could be due to a variety of factors, not the least of which being the temporal differences in data collection between the variables in the mediation analysis. The current study uses a cross-sectional design, while the UK study is conducted across three waves, with temporal separation between the exposure, mediator, and outcome (Cosco *et al.*, 2019). Although, the current observed cross-sectional mediating effect of social support on the association between income and resilience is in line with the findings from a longitudinal study by Phillips *et al.* (2016), where the outcome (i.e. resilience) was measured 2 years after the explanatory variables (i.e. social engagement and income). Similarly, in a longitudinal study of adults over the age of 50 years, Netuveli *et al.* (2008) found that social support was positively associated with resilience, specifically pre- and during adversity. A qualitative study by Kok *et al.* (2018) found that despite low SEP, older adults may build resilience through social support. Their findings highlight the importance of financial support and

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Table 3. Summary of mediation analyses with depression vulnerability as outcome

EXPOSURE	MEDIATOR	ESTIMATE	VALUE	95% CI	*P* VALUE
Income	Physical activity	Mediation effect	−0.01	−0.02, −0.01	<0.001
		Direct effect	−0.15	−0.19, −0.10	<0.001
		Total effect	−0.16	−0.20, −0.11	<0.001
		Proportion mediated	0.06	0.04, 0.11	<0.001
Income	Social network	Mediation effect	−0.03	−0.03, −0.02	<0.001
		Direct effect	−0.15	−0.19, −0.10	<0.001
		Total effect	−0.18	−0.22, −0.13	<0.001
		Proportion mediated	0.16	0.11, 0.23	<0.001
Education	Physical activity	Mediation effect	−0.001	−0.003, 0.00	0.096
		Direct effect	−0.01	−0.02, 0.02	0.59
		Total effect	−0.01	−0.02, 0.02	0.56
		Proportion mediated	0.11	−0.79, 0.86	0.59
Education	Social network	Mediation effect	0.001	−0.001, 0.00	0.70
		Direct effect	−0.01	−0.02, 0.02	0.53
		Total effect	−0.01	−0.02, 0.02	0.57
		Proportion mediated	−0.07	−1.22, 1.05	0.95

community support for low SEP individuals, in addition to the support of friends and family.

These findings provide tentative support for the use of targeted interventions for middle-age and older adults. Specifically, programs aimed to enhance social networks and reduce social isolation for individuals with low SEP might be promoted, with the potential to facilitate positive mental health outcomes. Further, interventions intending to increase physical activity levels may also alleviate the negative impact of low SEP and improve overall well-being into older age. However, further research is necessary to determine the causal relationships between these variables, and therefore, provide stronger support for these types of interventions.

Several limitations must be taken into consideration in the interpretation of these results. The cross-sectional nature of the data collection may inhibit some of the capacity to interpret the findings from mediation analysis in a causal manner. However, the nature of the exposures, e.g. SEP, is fairly stable; therefore, it could be argued that SEP was established prior to being formally measured in the CLSA. Still, it is important for future studies to use longitudinal and experimental designs to draw stronger inferences regarding the total effect and mediation estimates described in this study. Further, additional confounders may exist that are not accounted for in this analysis, and it is also possible that reverse causation exists such that MHR also impacts physical activity and social network structure. As with any study using self-reported measures, there are elements of social desirability and recall bias that must be taken into consideration (Althubaiti, 2016). Physical activity is particularly subject to overestimation (Shephard, 2003); however, in the calculation of resilience residuals an objective measurement of physical performance was used. Lastly, the CLSA comprehensive cohort is comprised of a fairly healthy, well-educated community-based sample, and therefore the results may not be generalizable to the entire Canadian population, specifically institutionalized, remote, or indigenous populations.

This study examined the correlates of MHR, measured as the discrepancy between one's reported depressive symptoms and one's predicted depressive symptoms according to their objective physical performance in a large cohort of Canadians spanning middle and older age. Socioeconomic factors (income and education) were found to be positively associated with MHR, with modifiable factors (i.e. physical activity and social networks) mediating the relationship. Therefore, the burden of poor mental health in aging adults might be alleviated through targeted interventions for low SEP individuals.

Conflict of interest

There are no conflicts of interest to declare.

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Description of authors' roles

S. Hopper helped with conceptualization, wrote the draft of the manuscript, and edited the manuscript. J. Best helped with conceptualization, preformed the statistical analysis, and edited the manuscript. A. Wister helped with conceptualization and edited the manuscript. T. Cosco formulated the research question, secured funding and ethical approval, and edited the manuscript.

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Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.1017/S1041610223000224

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