


The Protective Role of the Internet in Depression for Europeans Aged 50+ Living Alone

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Social Media + Society
January-March 2022: 1–9
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DOI: 10.1177/20563051221077675
journals.sagepub.com/home/sms


Abstract

Depression is a significant and limiting health problem, and living alone has been identified as an essential determinant of depressive symptoms in middle-aged and older adults. This study looks at this relationship by introducing a new factor into the equation—the Internet—which has become increasingly relevant for communication and interaction. It aims to assess to what extent the use of the Internet can mitigate the association between living alone and depression in middle-aged and older adults. This study focuses on a sample of 64,260 individuals aged 50+ who are resident in Portugal, Greece, Italy, Spain, Denmark, Sweden, Austria, Belgium, France, Germany, Switzerland, Luxemburg, Poland, Czech Republic, Slovenia, Estonia, and Croatia and were surveyed in the context of the SHARE project (Survey of Health, Ageing, and Retirement in Europe), Wave 6. The results showed that living alone relates to greater odds of depression. Nevertheless, of particular relevance is that they also evidenced that the Internet has a moderating role on this relationship, revealing a protective role, since Europeans aged 50+ who live alone and are Internet users are less likely to experience depression than other older adults. The findings reinforce the importance of policies aimed at digital inclusion to benefit the mental health of older adults who live alone in Europe.

Keywords

depression, living alone, Internet, 50+ individuals, Europe

Introduction

Living alone tends to be increasingly common at older ages (Mudrazija et al., 2020; Reher & Requena, 2018) and is related to several economic and social challenges (Rolls et al., 2010). In this sense, living alone has generally been associated with several health risk behaviors (Mudražija et al., 2019) with an increased risk of premature mortality (Holt-Lunstad et al., 2015) and directly and indirectly associated with the mental health of older people (Djernes, 2006; Gyasi et al., 2020; Hu et al., 2012; D. Russell & Taylor, 2009; Stahl et al., 2017). Studies on depression in older adults have also linked living alone with an increased risk of depression (Djernes, 2006; Gyasi et al., 2020; Hu et al., 2012; D. Russell & Taylor, 2009; Stahl et al., 2017).

Depression is a significant health problem as it contributes to years lived with disability and suicide deaths (World Health Organization [WHO], 2017). Depression has been associated with an increased risk of mortality (Holwerda et al., 2016) and feelings of anxiety and incapacity and, thus,

represents a significant obstacle to successful aging (Girgus et al., 2017). Older adults who have this mental illness also experience a lower quality of life (QoL) (Chachamovich et al., 2008; Conde-Sala et al., 2017). The study of depression in older adults in the European context has been receiving increased attention (Castro-Costa et al., 2007; Conde-Sala et al., 2019).

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A critical aspect for older adults' mental health, including those living alone (Djundeva et al., 2019; Gyasi et al., 2020; D. Russell & Taylor, 2009), relates to the social network (Litwin et al., 2015; Stoeckel & Litwin, 2016). Indeed, with increasing age, social networks face an important restructuring (Antonucci et al., 2014; Carstensen, 1995; Charles & Carstensen, 2010; Khan & Antonucci, 1980) due to the appearance of obstacles to their maintenance (Cornwell & Laumann, 2015). However, the maintenance of social networks is crucial, since the social ties can lessen the impact of moments of crisis of older persons, in general, and of those individuals who live alone, in particular, by contributing to their mental health (Gyasi et al., 2020), while the restricted social networks relate to lower levels of well-being (Djundeva et al., 2019). In this context, the Internet may serve as an essential means of communication (Antonucci et al., 2017; Reis et al., 2021; Silva et al., 2018).

In this regard, different theoretical frameworks explain the positive effect of Internet use. For instance, according to the buffer model of social support, this support protects people from the potentially adverse effects of stressful events (S. Cohen & Wills, 1985). Drawing on this theoretical framework, recent research has concluded that Internet use may play a role in coping with health-related problems connected to later stages of the life course (Van Ingen et al., 2017). The theory of latent ties also demonstrates that the Internet constitutes an essential means of communication that may activate latent and social relations, reformulate weak social ties, and reinforce social solid ones (Haythornthwaite, 2002, 2005).

In a systematic review, Forsman and Nordmyr (2017) identified different psychosocial links between Internet use and mental health. These include increased access to resources within the community, empowered social inclusion at the societal level, and enhanced interpersonal interaction at the individual level. The use of the Internet for communication purposes has often been associated with better mental health (Lam et al., 2020). Internet use has also been related to decreased loneliness (Silva et al., 2022a) and social isolation in older adults (Silva et al., 2022b). In the same vein, several investigations of older adults have highlighted that the Internet allows them to maintain relationships that are important for their well-being (Antonucci et al., 2017; Martinez-Pecino et al., 2013).

In contrast to studies that point to the positive effects of Internet use, some research has found no direct association between technology use and mental health in older adults (Elliot et al., 2014), and other studies have concluded that some types of use hurt psychological well-being (Huang, 2010). Some theoretical frameworks, such as the *time displacement* theory, argue that technology negatively affects social relationships. According to this theory, Internet use tends to be related to less face-to-face interaction time with family and friends (N. Nie & Hillygus, 2002).

Overall, literature has highlighted the need for further studies on the relationship between Internet use and depression in different populations and contexts (Wang et al., 2019). Thus, further research is needed to better understand the impact of the Internet in the lives of older people (Damant et al., 2017; Dickinson & Gregor, 2006).

Therefore, the main objective of this study is to analyze with a large European sample the moderating role of the Internet in the relationship between living alone and depression, after having controlled for the influence of other characteristics of the middle-aged and older individuals, frequently associated with depression. Considering the importance of social interaction for reducing depression and the fact that the Internet is an increasingly important means of communication, it would be reasonable to expect that it affects the relation between living alone and depression.

Methods

Sample

This study focuses on 64,260 individuals aged 50 and over who were interviewed as part of the SHARE—Survey of Health, Ageing and Retirement in Europe (Wave 6) in Southern (Portugal, Greece, Italy, Spain); Northern (Denmark and Sweden); Central (Austria, Belgium, France, Germany, Switzerland, Luxemburg); and Eastern Europe (Poland, Czech Republic, Slovenia, Estonia, Croatia).

Details of the SHARE study in Europe have been described elsewhere (Malter & Börsch-Supan, 2017). Briefly, in Wave 6 (data collection of Wave 6 started in February of 2015 and lasted until November 2015), a survey was conducted in a representative sample of the non-institutionalized population aged 50 and over. Interviews were face-to-face and took place in the household. Trained interviewers conducted interviews using a computer-assisted personal interviewing (CAPI) program (Malter & Börsch-Supan, 2017). The interviewer asked the respondents the questions that appeared on the computer screen and marked their answers on the computer. The interview with each respondent lasted an average of 70 min.

Measures

Dependent Variable. Depressive symptom counts are based on the EURO-D scale (Guerra et al., 2015; Prince et al., 1999), which includes 12 items (depressed mood, pessimism, suicidality, guilt, trouble sleeping, loss of interests, irritability, appetite, fatigue, concentration, enjoyment, and tearfulness during the month preceding the interview). Items require a yes/no response, and the total score ranges from 0 to 12.

The cut-off for clinically relevant depressive symptoms is ≥ 4 (Conde-Sala et al., 2019; Guerra et al., 2015). As in previous studies, a distinction was made between individuals with four or more symptoms and individuals with lower scores (Dewey & Prince, 2005; Guerra et al., 2015).

Moderating Variable. Dichotomous variable related to regular Internet use: uses the Internet and does not use the Internet.

Variable of Interest. Dichotomous variable related to living arrangements: living alone in a private home and living with one or more persons in a private home

Covariates

This study controls for a set of sociodemographic, economic, and health characteristics that have been identified in the literature as determinants of depression in older adults (Calvó-Perxas et al., 2016; Conde-Sala et al., 2019; Djernes, 2006; Huang et al., 2010; Kok et al., 2012; Litwin et al., 2015; Portellano-Ortiz et al., 2018; Stahl et al., 2017; Weyerer et al., 2013; Ylli et al., 2016; Zunzunegui et al., 2007).

Age; years of schooling; self-perception of financial stress: “great difficulty” or “some difficulty” in coping with monthly expenses, “easy” or “very easy” to handle monthly expenses; employment status: “Employed or self-employed,” “retired,” “unemployed,” “permanently sick or disabled,” “homemaker,” or “other.”

Social Network Scale: It is a scale that combines the five main characteristics of the social network, that is, size, geographical proximity, frequency of contact, emotional closeness, and type of relationship. The scale has higher values for individuals with a larger network, with more people in the network who live up to 25 km away, with more people in the network whom they contact weekly or more frequently, with more people in the network considered to be close or very emotionally close, and with more diversified networks, that is, with a greater variety of relationship types. The scale ranges from 0 to 4 values (Litwin & Stoeckel, 2014).

Activities of Daily Living (ADLs): This includes the number of limitations in ADLs that respondents reported having difficulty doing alone (0–6), such as bathing, dressing, and toileting. Higher scores represented poorer function or greater dependence.

Chronic diseases: The number of chronic medical conditions, as measured by self-reported doctor’s diagnosis, was recorded. Respondents could choose from 14 named medical conditions and include other unnamed medical conditions diagnosed by a doctor such as a heart attack, high blood pressure or hypertension, high blood cholesterol.

Welfare regime: We distinguished between Southern Europe (Portugal, Greece, Italy, and Spain), Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, Germany, Switzerland, Luxemburg), and Eastern Europe (Poland, Czech Republic, Slovenia, Estonia, Croatia). In the regression analysis, Southern Europe is the reference category.

Data Analysis

Statistical analyses were performed using SPSS software, version 25. In the first stage, univariate descriptive analyses

were conducted. We used the chi-square test to assess the interdependence between two nominal variables. The sample means were also compared using Student *t*-tests for independent samples. The statistical results of the tests with $p < .05$ were considered significant. The results from these tests were also complemented with effect size measures (Cohen’s *d*/Phi). The interpretation of these results was based on J. Cohen (1988). Calibrated individual weights were used because the SHARE survey does not have a uniform sample design.

In the second stage, the moderating role of the Internet on the relationship between living alone and depression was tested. For this purpose, logistic regression analyses were carried out using PROCESS software.

Results

Table 1 shows that the group of individuals who live alone present a higher percentage of depression (trivial effect size) and a lower percentage of Internet use when compared with those not living alone (small effect size). This group is also composed of older adults (medium effect size), females (small effect size), and more years of schooling individuals (trivial effect size). Moreover, the group of individuals who live alone also has a higher percentage of older adults in a situation other than being employed or self-employed (small effect size) and lowest scores on the Social Network Scale (small effect size).

Regarding physical health, individuals living alone show more limitations in performing basic ADL (small effect size) and more chronic diseases (small effect size).

In Table 2, in Model 1, which comprises only the relation between the sociodemographic, economic, and health factors, and depression, it is observed that women present higher odds of depression. However, an increase in years of schooling and higher scores on the Social Network Scale are related to less depression.

In terms of physical health, an increase in the number of limitations in performing ADL and the number of chronic diseases is positively associated with depressive symptoms. Concerning welfare systems, older adults living in Northern and Eastern European systems have lower odds of depression than their peers living in Southern Europe.

In Model 2, introducing the two main variables (living alone and the Internet), we found that most of the above variables—except age and welfare systems—have a similar relationship with depression. In fact, in this model, age is positively associated with depressive symptoms and is related to an increase in the odds of depression. Adults living in Central Europe also presented greater odds of depression than their counterparts in Southern Europe. In this model, it was found that living alone is related to an increased odd of depression. Internet use is associated with lower odds of depression on the European continent.

Table 1. Sociodemographic, Economic, and Health Characteristics of Adults Living Alone and Not Living Alone.

	Living alone	Not living alone	χ^2/t	Cohen's <i>d</i> /Phi
Depression				
Depressed (Euro-D ≥ 4)	35.7	27.7	392.17*	.080
Non-Depressed (Euro-D < 4)	64.3	72.8		
Internet				
Yes	38.5	51.5	654.874*	.101*
No	61.5	48.5		
Sociodemographic and economic characteristics				
Age (mean, <i>SD</i>)	70.21 (11.662)	64.59 (10.029)	54.931*	.531**
Female (%)	65.7	50	1,557.577*	.156*
Male (%)	34.3	50		
Years of schooling (mean, <i>SD</i>)	10.49 (4.510)	10.90 (4.494)	-9.735*	.096
Employed or self-employed	20.8	32.1	684.44*	.103*
Other situation	79.2	67.9		
Positive financial situation (%)	58.4	61.8	141.159*	.047
Negative financial situation (%)	41.6	38.2		
Social Network Scale 0–4 (mean, <i>SD</i>)	1.89 (.864)	2.05 (.843)	-14.607*	.149*
Health				
ADL (mean, <i>SD</i>)	.350 (.982)	.240 (.892)	12.661*	.122*
Chronic diseases (mean, <i>SD</i>)	2.01 (1.704)	1.68 (1.579)	21.685*	.210*

SD: standard deviation; ADL: activities of daily living. Wave 6 version 7.0.0, $N=64,260$ (N , unweighted).

Effect size (Cohen's *d*/Phi): small effect size*; medium effect size**; large or very large effect size***.

$\chi^2/t=*$ $p < .001$.

Table 2. The Moderating Role of the Internet on the Relationship Between Living Alone and Depression.

	Model 1		Model 2		Model 3	
	B	OR (95% CI)	B	OR (95% CI)	B	OR (95% CI)
Constant		.135		.181		.182
Age	.004	1.000 (.998–1.003)	-.004	.996 (.993–.999)**	-.004	.996 (.993–.999)**
Gender (Female)	.718	2.051 (1.961–2.144)***	.699	2.013 (1.923–2.105)***	.697	2.009 (1.92–2.102)***
Years of schooling	-.023	.977 (.972–.983)***	-.016	.984 (.978–.989)***	-.016	.984 (.978–.989)***
Employed or self-employed	.631	1.879 (1.793–1.97)	.601	1.825 (1.740–1.913)	.604	1.83 (1.745–1.919)
Negative financial situation	-.011	0.989 (.928–1.053)***	.015	1.015 (.953–1.081)***	.009	1.009 (.947–1.075)***
Social Network Scale	-.058	.944 (.920–.968)***	-.047	.954 (.930–.979)***	-.046	.955 (.931–.980)***
ADL	.447	1.564 (1.515–1.615)***	.441	1.554 (1.505–1.605)***	.440	1.553 (1.505–1.604)***
Chronic diseases	.302	1.352 (1.333–1.372)***	.299	1.349 (1.330–1.368)***	.299	1.349 (1.33–1.368)***
Welfare regime						
Northern	-.332	.717 (.659–.781)***	-.259	0.772 (.707–.842)***	-.260	.771 (.707–.842)***
Central	.035	1.036 (.977–1.099)	.068	1.070 (1.008–1.137)*	.066	1.068 (1.005–1.134)*
Eastern	-.103	.902 (.851–.955)***	-.104	.901 (.851–.955)***	-.106	.899 (.849–.953)**
Living alone			.068	1.070 (1.015–1.128)**	.136	1.146 (1.073–1.224)***
Internet			-.244	.784 (.743–.826)*	-.204	.815 (.770–.863)***
Internet \times living alone					-.179	.836 (.754–.928)**

Source: SHARE Wave 6, version 7.0.0, unweighted data.

OR: odds ratio; CI: confidence interval; ADL: activities of daily living; $N=51,551$ (N , unweighted).

* $p < .05$; ** $p < .01$; *** $p < .001$.

Finally, in Model 3, introducing the term of interaction (Internet \times living alone) enabled us to verify that, in Europe, adults aged 50+ years who live alone and use the Internet are less likely to be depressed than other middle-aged and older adults, which confirms the hypothesis of this study.

Discussion

The main goal of this study was to analyze, with a large sample, the moderating role of the Internet in the relationship between living alone and depression in Europe, after having

controlled for the influence of the characteristics of the individuals frequently associated with depression.

In this research, by the previous literature, living alone positively relates to depression (Das Gupta et al., 2020; Djernes, 2006; Gyasi et al., 2020; Hu et al., 2012; D. Russell & Taylor, 2009; Stahl et al., 2017). However, Internet use by adults aged 50+ years is related to fewer depressive symptoms in Europe. This corroborates the results of previous studies (Cotten et al., 2014; Wang et al., 2019) and may reinforce the potential importance of the Internet as a means of communication (Antonucci et al., 2017; Martinez-Pecino et al., 2013; Román-García et al., 2016; C. Russell et al., 2008).

The main result of this study is that the Internet moderates the relationship between living alone and depression; that is, adults who live alone and use the Internet are less likely to experience depression than other middle-aged and older adults, confirming our hypothesis. Considering the increasing number of older adults living alone in the current society (Mudrazija et al., 2020; Reher & Requena, 2018), the result is relevant since the study focuses on a large sample and controls for variables that have traditionally been associated with depression.

One possible explanation for this outcome is that the Internet can constitute a crucial means of communication (Antonucci et al., 2017; Martinez-Pecino et al., 2011; Reis et al., 2021) with social networks of older persons living alone, which are very important for their well-being (Djundeve et al., 2019; Gyasi et al., 2020). As stated by Papacharissi (2015), all media foster communication. Thus, our results align with recent studies that suggest that, although adults living alone have less interaction with their family, through online communication, they can communicate like people who live with their family (Nakagomi et al., 2022). In this sense, the Internet can prevent depression by increasing social contact (Nakagomi et al., 2022). Furthermore, according to Szabo et al. (2019), contact with family and friends through the Internet helps older adults to maintain their sense of belonging, increase social engagement and receive social support, which can be especially important when family members are geographically distant (Szabo et al., 2019). Thus, this study also supports the literature that indicates that social media are essential for activating, strengthening, or maintaining ties (Haythornthwaite, 2002, 2005), even in contexts where older adults reside alone. It also complements the literature that states that social media are essential resources for older adults' mental health (Bonsaksen et al., 2021; Forsman & Nordmyr, 2017).

This study also observed the influence of the traditional determinants associated with depression, controlled in the analyses. Thus, we could observe that in Europe, as underlined in the research literature, depression is influenced by a set of sociodemographic, economic, and health characteristics. In fact, as in other studies, increasing age (Weyerer et al., 2013) and being female (Calvó-Perxas et al., 2016; Conde-Sala et al., 2019; Ylli et al., 2016; Zunzunegui et al.,

2007) are positively related to depression. However, increased education reduces the chances of depressive symptoms, which also corroborates the results of other studies (Calvó-Perxas et al., 2016; Kok et al., 2012; Portellano-Ortiz et al., 2018; Ylli et al., 2016). Depression has also been associated with financial difficulties (Calvó-Perxas et al., 2016; Conde-Sala et al., 2019; Portellano-Ortiz et al., 2018; Ylli et al., 2016) and increased chronic diseases and functional limitations (Calvó-Perxas et al., 2016; Conde-Sala et al., 2019; Djernes, 2006; Huang et al., 2010; Portellano-Ortiz et al., 2018; Weyerer et al., 2013; Ylli et al., 2016).

Our results reinforce the possibility that Internet use may decrease the effect of social inequalities concerning depression in older adults (Mu et al., 2021). This is in line with research that has concluded that socio-economic characteristics contribute to disparities in depression at an older age. Using this technology can decrease this disparity, contributing to the mental health of middle-aged and older individuals (Mu et al., 2021).

This study has several limitations. The main one is that a single item was used to measure overall Internet use. Nevertheless, a yes/no response to whether someone regularly uses the Internet has frequently been used to assess Internet use by seniors (Cotten et al., 2012, 2014; Hogeboom et al., 2010; König & Seifert, 2020; König et al., 2018; Silva et al., 2017). Nonetheless, considering that the impact of the Internet in the social sphere depends on the type of activities conducted online (Chen, 2013; Hampton et al., 2009; Zhao, 2006), future studies need to consider the impact that different uses of the Internet may have on depression. It is also important to remember that Wave 6 of the SHARE project was collected in 2015. SHARE Wave 7 was dedicated to life stories, and data collection of Wave 8 was interrupted due to the COVID-19 pandemic. Since there is still evidence worldwide about the existence of a high percentage of older people who do not use the Internet (König et al., 2018; Silva et al., 2017) also of those who live alone (Mudrazija et al., 2020; Reher & Requena, 2018) and those who suffer depression (Castro-Costa et al., 2007; Conde-Sala et al., 2019), the findings of this study are entirely relevant to today's society. Also, these issues are gaining increasing relevance in the current era marked by the COVID-19 pandemic, where recommendations for self-isolation emerge (García-Portilla et al., 2021). Since seniors are considered high risk under COVID-19, and their deaths are more common, they can accumulate stress and fear (Hui et al., 2020). The COVID-19 outbreak and associated physical distancing measures altered the social world for most older adults, but people who live alone may have been disproportionately affected (Fingerman et al., 2021). Due to the COVID-19 pandemic, social isolation of the older population has intensified mental health concerns about anxiety, depression (García-Portilla et al., 2021; Sepúlveda-Loyola et al., 2020; WHO, 2020), and even suicides (Rana, 2020; Sher, 2020). As noticed by some authors, the outbreak of COVID-19 will have a long-term and profound impact on

older adults' health (Wu, 2020). Thus, attention should be paid to adults who may struggle to maintain social contacts in light of physical distancing guidelines and overcome the challenges brought by this complex environment. The outcomes of this study precisely show the need to promote Internet use to face depression among older adults living alone.

Despite the above limitations, this study contributes to the open debate about the relation between Internet use and mental health where literature shows unclear outcomes and mixed evidence of the connection between the use of the Internet, well-being, and depression (Barbosa Neves et al., 2019; Hülür & Macdonald, 2020; P. Nie et al., 2017; Quintana et al., 2018; Sum et al., 2008). Studies are often criticized due to small samples and lack of consistency in measurement, and the need to control for co-variables (Cotten et al., 2012; Hargittai et al., 2019; Hülür & Macdonald, 2020; Meshi et al., 2020). In this regard, we contribute with a large sample of 64,260 individuals of different European countries and controlling for the influence of co-variables, frequently associated with depression, to evidence the moderating role of the Internet in the relationship between living alone and depression in middle-aged and older adults, and show the importance of this technology in preventing and combating depression in those who live alone. Thus, this study has important implications for a society with an increasing number of older people who live alone. It points to the need to develop policies that address the e-inclusion of these individuals to improve their mental health.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The authors are grateful for the funding awarded to SHARE Portugal by the Calouste Gulbenkian Foundation and by FCT/MCTES through National Funds (PIDDAC) and European Regional Development Fund (ERDF) through the Operational Program PORNorte and PORLisboa, AACN 01/SAICT/2016, Application n. 022209 DATALAB. The SHARE data collection has been funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N 211909, SHARE-LEAP: GA N 227822, SHARE M4: GA N 261982), Horizon 2020 (SHAREDEV3: GA N 676536, SERISS: GA N 654221), and DG Employment, Social Affairs and Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the US National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGH04-064, HHSN271201300071C), and from various national funding sources is gratefully acknowledged (see www.share-project.org).

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