

## Identifying modifiable factors associated with health optimism in older adults

### Abstract

**Objective:** Despite the documented importance of health optimism for enhancing health outcomes, very little work has been done to examine who experiences health optimism and under what conditions. The present study sought to identify modifiable factors associated with health optimism that could constitute the focus of future intervention efforts designed to promote health optimism among older people.

**Design:** Participants were 453 (44% males) community-based Western Australians aged 60+ years ( $M = 70.39$  years,  $SD = 6.06$ ). Participants completed questionnaires to assess sociodemographic characteristics and provided information relating to physical and psychological health status.

**Results:** Almost a quarter of participants (24%;  $n = 108$ ) were classified as health optimists. Results from a multivariate regression analysis found quality of life, psychological well-being, and age to be directly and positively associated with health optimism. A subsequent path analytic model found depression (negatively) and self-efficacy (positively) to be indirectly associated with health optimism via both psychological well-being and quality of life.

**Conclusion:** These findings extend the limited evidence on health optimism in older adults by identifying various modifiable factors that may constitute potential areas of focus for future interventions designed to enhance health outcomes via the fostering of health optimism.

**Keywords:** health optimism; psychological well-being; quality of life; older adults.

## Introduction

Populations around the world are ageing rapidly, which is resulting in dramatic increases in both the proportion and absolute number of older people (World Health Organization [WHO], 2015). Currently, around 13% of the world population is aged 60+ years, with this proportion forecast to increase to 21% in 2050 and 28% in 2100 (United Nations, 2017).

Reflective of the 'oldest old' being the fastest growing population segment (National Institutes of Health [NIH], 2011), the number of persons aged 85+ years is expected to increase 9-fold and the number of centenarians 44-fold by 2100 (United Nations, 2017). Australia, the context of the present study, is one of the fastest ageing societies in the world, with 21% of the population already aged 60+ years (Australian Bureau of Statistics [ABS], 2017). The number of people entering older age groups presents a challenge to national infrastructures, particularly healthcare systems (Goldman et al., 2013; NIH, 2011). The risk of chronic disease rises with increasing age, as does the probability of experiencing multiple chronic conditions (Barnett et al., 2012; Walker, 2007). This comorbidity is associated with numerous negative health outcomes, ranging in severity from functional deterioration to mortality (Gijssen et al., 2001; Marengoni et al., 2011).

The combination of population ageing and the increasing prevalence of many chronic diseases in older age highlights the importance of identifying modifiable factors that can be targeted in interventions designed to improve health and well-being in seniors. A promising area of research relates to the concept of 'health congruence', which represents the level of agreement between individuals' subjective (i.e., self-rated) health and their objective health (Chipperfield, 1993; Hong, Zarit, & Malmberg, 2004; Ruthig & Chipperfield, 2006; Ruthig, Chipperfield, & Payne, 2011). According to Chipperfield's (1993) health congruence

framework, discrepancies between these two health measures (i.e., health incongruence) can manifest in two forms: health pessimism (where individuals' subjective health is poor relative to their objective health) and health optimism (where individuals' subjective health is better than their objective health).

Health optimism as conceptualised in the health congruence literature has been found to predict superior physical and psychological health outcomes compared to health pessimism and health congruence. Specifically, cross-sectional studies have found health optimism to be associated with greater functional ability, better medication adherence, higher levels of exercise, fewer hospital admissions, lower levels of depression, greater social engagement, and enhanced psychological well-being (Hong, Oddone, Dudley, & Bosworth, 2005; Hong et al., 2004; Ruthig & Allery, 2008). In addition, longitudinal studies of older adults with objectively poor health have found that those classified as health optimists were less likely to die prematurely than those with congruent health ratings (Borawski, Kinney, & Kahana, 1996; Chipperfield, 1993). Of note is that studies operationalising health optimism in other ways (e.g., as a dispositional trait rather than positive incongruence between objective and subjective health) have indicated the existence of more variable health outcomes (Friedman et al., 1993; Schwarzer, 1994). The value of utilising the congruence approach in the present study lies in the consistent association between this form of health optimism and positive health outcomes, thereby providing greater insight into potentially effective interventions that can be implemented to improve the health of older people.

Despite the documented importance of health optimism to health outcomes in the health congruence framework literature, very little work has been done to examine who experiences

this form of health optimism and under what conditions. The limited work conducted has treated health optimism as an independent variable that may predict associated health outcomes. To date, there does not appear to have been consideration given to health optimism as a dependent variable, which is a critical first step in informing potential strategies for its enhancement. The aim of the present study was thus to identify modifiable factors that are cross-sectionally associated with health optimism that could constitute the primary focus of future intervention efforts designed to promote health optimism among older people.

Given the lack of prior research specifically focusing on factors that may predict health optimism, numerous variables associated with subjective health were assessed in the present study to facilitate an initial investigation of potential contributing factors. These variables were the sociodemographic factors of age, gender, education, marital status, and socioeconomic status (French, Sargent-Cox, & Luszcz, 2012; Galenkamp, Braam, Huisman, & Deeg, 2011); the psychosocial factors of quality of life, depression, social support, self-efficacy, self-esteem, and psychological well-being (Bryant, Beck, & Fairclough, 2000; Burke et al., 2012; Rodin & McAvay, 1992; Sirola et al., 2010; White, Philogene, Fine, & Sinha, 2009); and the health factors of physical activity and weight status (Bailis, Segall, & Chipperfield, 2003; Leinonen, Heikkinen, & Jylhä, 2001). The resulting model provides an enhanced conceptual understanding of health optimism and suggests potential components of strategies to improve the health of older people at both individual and population levels.

## **Methods**

### **Sample**

A community-based sample of Western Australians aged 60+ years was recruited as part of a larger study designed to assess the impact of volunteering on healthy aging in older Australians (Authors, 2015). Prior to participating in either the control (non-volunteering) or intervention (volunteering) conditions, individuals were assessed on a variety of physical, physiological, and psychological measures. The present study is based on these baseline cross-sectional data.

Recruitment methods included placing notices in community newspapers and seniors' publications, radio announcements, circulating flyers at seniors' events and retirement villages, and distributing notices through local government and non-government organizations across the Perth metropolitan area. In total, 453 older adults (44% males) participated in the study. Participants ranged in age from 60 to 95 years, with 49% of the study sample aged 60-69 years and 51% aged 70+ years ( $M = 70.39$  years,  $SD = 6.06$ ). The age and gender profile of the sample was generally comparable to that of the broader population of Western Australian adults aged 60+ years (48% males, 52% of 60+ year olds being in the 60-69 years age bracket and 48% in the 70+ years age bracket (ABS, 2016). Ethics approval for the study was obtained from a university Human Research Ethics Committee.

## **Measures**

Participants completed questionnaires to assess the sociodemographic, psychosocial, and health factors listed above. Depending on the preference of the participants, questionnaires were either posted in the mail or disseminated via a link to an online version of the instrument.

### ***Health optimism***

Consistent with previous research (Idler & Benyamini, 1997), self-rated health was assessed with the item “How would you describe your physical health?”. Participants could respond on a 5-point scale ranging from 1 (*very good*) to 5 (*very bad*). Objective health was assessed via a health history questionnaire that asked participants to indicate conditions with which they had been diagnosed. Responses were used to generate a Charlson Comorbidity Index (CCI) for each participant (Charlson, Pompei, Ales, & MacKenzie, 1987). In step 1, weights are assigned based on each condition’s 1 year mortality risk, with higher weights indicative of greater mortality risk. In step 2, the sum of the weights of the diseases is calculated, providing the CCI. For the purposes of the present study, participants with a  $CCI \geq 1$  were considered to be in poor objective health. Those with a CCI score  $< 1$  were considered to be in good objective health.

Participants were classified as health optimists and assigned a dummy code of 1 if they were in poor objective health (i.e., a  $CCI \geq 1$ ) but described their health as “very good” or “good”. All other participants were assigned a dummy code of 0. This health optimist categorical variable was used in all analyses to facilitate comparisons between health optimists and health realists/pessimists.

### ***Sociodemographic variables***

The sociodemographic variables included in the study were age, gender, education level (no formal school/primary school, high school, technical/trade, undergraduate, postgraduate), living status (living alone or with others), and socioeconomic status (SES). SES was calculated from participants’ postcodes using the Australian Bureau of Statistics (2011) Socio-Economic Index For Areas.

### ***Psychosocial variables***

Quality of life was assessed using the Global Quality of Life Scale (Hyland & Sodergren, 1996). Participants indicated their overall quality of life on a scale ranging from 0 (*no quality of life*) to 100 (*perfect quality of life*). Psychological well-being was assessed using the 14-item Warwick-Edinburgh Mental Well-Being Scale (Tennant et al., 2007). Participants responded to each item describing their experiences over the last week (e.g., *I've been feeling cheerful*) on a 5-point scale that ranged from 1 (*none of the time*) to 5 (*all of the time*). Cronbach's alpha in the present study was .93.

Social support was assessed using the 24-item Social Provision Scale (Cutrona & Russell, 1987). Participants responded to each item (e.g., *There are people I can depend on to help me if I really need it*) on a 4-point scale that ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). Cronbach's alpha in the present study was .93. Depression was assessed using the 20-item Center for Epidemiological Studies Depression Scale (Radloff, 1977). Participants responded to each item describing their experiences over the last week (e.g., *I was bothered by things that usually don't bother me*) on a 4-point frequency scale that ranged from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). Cronbach's alpha in the present study was .87.

Self-esteem was assessed using the 10-item Rosenberg Self-Esteem Scale (1965). Participants responded to each item (e.g., *On the whole, I am satisfied with myself*) on a 4-point scale that ranged from 0 (*strongly disagree*) to 3 (*strongly agree*). Cronbach's alpha in the present study was .89. Self-efficacy was assessed using the 10-item General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995). Participants responded to each item (e.g., *I am confident that I could deal efficiently with unexpected events*) on a 4-point scale that ranged from 1 (*not at all true*) to 4 (*exactly true*). Cronbach's alpha in the present study was .90.

### ***Health factors***

As high body mass index (BMI) is a risk factor for many chronic diseases, including cardiovascular diseases, diabetes, osteoarthritis, certain cancers, and liver and gall bladder diseases (Kopelman, 2000; WHO, 2017), it was included as a variable in analyses. BMI was calculated using height and weight measurements taken by trained research associates at an interview attended by participants as part of the broader study (Authors, 2015). Physical activity was assessed using the item “How many hours of moderate to vigorous activity (that is, physical activity that makes you breathe harder or puff and pant) would you do in an average week?”. Participants responded on a 5-point scale that ranged from *0 hours* to *5 or more hours*.

### **Statistical Analysis**

Given the limited body of prior research and the lack of formalised theoretical frameworks upon which to base decisions regarding potential factors associated with health optimism, multiple stages of data analysis were conducted to identify and assess relevant variables. In the first stage, correlational analyses were performed to assess the relationships between the variables identified in previous studies as being associated with subjective health and therefore of potential relevance to health optimism. Pearson product-moment correlations were used to calculate the association between continuous variables, point-biserial correlations were used to assess the relationship between continuous and dichotomous variables, and phi correlations were used to assess the relationship between dichotomous variables. All bivariate correlations were  $< .70$ , suggesting that multicollinearity was unlikely to distort model estimation (as per Dormann et al., 2013).

In the second stage, those variables that emerged as being significantly associated with health optimism in the correlational analyses were entered simultaneously into bootstrapped

multivariate logistic regression to determine the unique and relative contribution of each variable. In the third stage, those variables found to be significantly associated with health optimism in the regression analysis (conducted in stage 2) and classified as modifiable, and therefore suited to being targeted in future intervention efforts, were further explored to facilitate specification of a mediational model. A mediational model was then created that specified all direct and indirect associations. This model was estimated using path analysis in *MPlus*, with bootstrapping used to reduce bias of standard errors and confidence intervals. Due to the categorical nature of the dependent variable of health optimism, the weighted least squares mean- and variance-adjusted (WLSMV) estimator was used. In all analyses, missing values were treated listwise as they comprised less than 5% of cases.

## **Results**

Nearly a quarter of participants (24%;  $n = 108$ ) were classified as health optimists. Correlational analyses (see Table 1) performed in stage 1 revealed that depression was negatively and significantly associated with health optimism, while age, quality of life, psychological well-being, self-esteem, and physical activity were positively and significantly associated with health optimism. A significant association between gender and health optimism was also observed, with males more likely than females to be health optimists. When these significant correlates were combined into a multivariate logistic regression analysis in stage 2, only age, quality of life, and psychological well-being were significantly associated with health optimism.

Given that quality of life and psychological well-being are potentially modifiable and may therefore be suitable targets of future intervention efforts, stage 3 involved consultation of the

correlation outputs computed in stage 1 to determine which of the remaining variables were significantly associated with quality of life and psychological well-being and could therefore be specified as potential indirect (i.e., more distal) factors associated with health optimism in the final model. As shown in Table 1, living status, SES, social support, depression, self-esteem, self-efficacy, BMI, and physical activity were significantly associated with quality of life. With the exception of SES, these variables were also significantly associated with psychological well-being.

*Insert Table 1 about here*

A mediational path analytic model was then created in which all (direct and indirect) pathways of interest were specified between the independent variables and health optimism (see Figure 1). The model provided an excellent fit to the data ( $\chi^2(11) = 8.26, p = .690$ ; CFI = 1.00; TLI = 1.00; RMSEA = .00 (.00, .04); WRMR = .47) and accounted for 65% of the variance in psychological well-being, 40% of the variance in quality of life, and 23% of the variance in health optimism. Standardized parameter estimates are presented in Table 2. All significant estimates were small to moderate in nature (as per Cohen's (1992) recommended effect size criteria for path coefficients where .10 = small, .30 = moderate, and .50 = large).

*Insert Table 2 about here*

*Insert Figure 1 about here*

Tests of the indirect effects (see Table 3) revealed that depression, self-efficacy, self-esteem, and social support were indirectly associated with health optimism via psychological well-

being. More specifically, stronger perceptions of self-efficacy, self-esteem, and social support were associated with stronger psychological well-being, which in turn was associated with a greater likelihood of being classified as a health optimist. On the reverse, higher depression scores were associated with lower psychological well-being and a reduced likelihood of being classified as a health optimist.

In addition, significant indirect effects were observed for physical activity, depression, self-efficacy, and BMI in relation to health optimism via quality of life (Table 3). In particular, higher depression and BMI scores were associated with lower quality of life and, in turn, a lower likelihood of being classified as a health optimist. Stronger self-efficacy and greater physical activity participation were indirectly associated with an increased likelihood of being classified as a health optimist (through higher quality of life scores).

*Insert Table 3 about here*

## **Discussion**

Given rapid population ageing and the substantial associated costs for individuals and societies (WHO, 2015), innovative strategies are needed that promote healthy ageing to enable individuals to live independently and productively for as long as possible (Fuster, 2017). Healthy ageing is a complex phenomenon that is influenced by a broad range of factors, and as such there are numerous potential approaches that could be taken to assist older people achieve this goal. Health optimism has been identified as one mechanism via which people can experience better health outcomes in later life (Borawski et al., 1996; Chipperfield, 1993; Hong

et al., 2005; Hong et al., 2004; Ruthig & Chipperfield, 2006; Ruthig, Hanson, Pedersen, Weber, & Chipperfield, 2011).

The aim of the present study was to investigate factors associated with health optimism to provide insights into possible methods of enhancing the extent to which older people experience this phenomenon, thereby providing policy makers and practitioners with options to consider when developing healthy ageing interventions. While caution is needed when interpreting these results due to the inability to make causal inferences and the absolute magnitude of estimates being modest (albeit significant) in many instances, the results provide initial evidence that there exists the potential to improve health optimism among seniors by targeting a range of personal attributes and behaviours. As outlined below, this targeting may need to occur at both individual and population levels to optimise outcomes.

In the first instance, the results indicate that as well as being highly desirable outcomes in their own right due to their direct association with a range of health benefits (Chida & Steptoe, 2008; Fortin et al., 2004; Howell, Kern, & Lyubomirsky, 2007; Tsai, Chi, Lee, & Chou, 2007), higher levels of psychological well-being and quality of life may have additional positive effects in terms of their relationship with health optimism. As such, individual- and societal-level interventions that focus on these variables are likely to produce positive outcomes at multiple levels. It can also be observed from the model that key factors associated with psychological well-being and/or quality of life (and, in turn, a greater likelihood of experiencing health optimism) include the psychological variables of depression and self-efficacy and a specific health-related behaviour (physical activity). These variables – all of which are modifiable through psychosocial and/or behavioural intervention – may therefore represent especially

important focus areas for future strategies designed to promote healthy ageing via improvements in health optimism.

Supporting previous research, the influential role of depression in the model indicates the importance of early diagnosis and adequate treatment of depressive symptoms among older adults (Casey, 2012; Moussavi et al., 2007). Similarly, the role of self-efficacy in the model highlights the importance of enhancing perceptions of competence among older adults (Clark & Dodge, 1999; Grembowski et al., 1993), particularly given that self-efficacy beliefs are more likely to diminish with age (Esposito, Gendolla, & Van der Linden, 2014). The identification of physical activity as a lifestyle behaviour that is associated with psychological well-being and quality of life is consistent with a large body of work demonstrating the benefits of physical activity across numerous domains (Bauman, Merom, Bull, Buchner, & Fiatarone Singh, 2016; Daskalopoulou et al., 2017).

In terms of sociodemographic characteristics, of the assessed variables (age, gender, education level, living status, and SES), only age was found to be associated with health optimism. Older participants were more likely than their younger counterparts to be health optimists, which is consistent with previous research on health congruence showing that older people tend to overestimate rather than underestimate their health (Hong et al., 2005; Hong et al., 2004; Ruthig & Chipperfield, 2006). Longitudinal studies on self-rated health have found that despite declining physical health and functional ability with increasing age, self-reported health by older adults tends to improve (Idler, 1993; Leinonen et al., 2001). This may be because the focus on physical aspects of health decreases with age, and older adults' definitions of health can transcend medically defined criteria to include factors such as positive attitudes, health promoting habits, and social factors such as the validation of their health by others (Benyamini,

Leventhal, & Leventhal, 2003; Borawski et al., 1996). In addition, seniors tend to compare themselves to peers who are in poorer health when rating their own health, and this downward comparison can assist them to maintain a positive outlook (Henchoz, Cavalli, & Girardin, 2008; Kaplan & Baron-Epel, 2003; van Doorn, 1999). Another possible interpretation is the survivor effect, where those with poorer health perceptions and greater risk of mortality have died, survived by those with more positive health perceptions (Idler, 1993). Finally, older people tend to adapt to the changes in their physical health and functionality, which can prevent deterioration in self-rated health (Leinonen et al., 2001).

### **Intervention implications**

The results of the present study suggest numerous possible intervention strategies to enhance health optimism among older people. The various strategies outlined below may constitute effective approaches to this task, although additional longitudinal work to verify the relationships identified in the present study would be useful to provide assurance of their potential efficacy.

Of the three variables (depression, self-efficacy, and physical activity) found to be associated with both psychological well-being and quality of life, all have the potential to be addressed at the individual level through the provision of tailored information and services to ensure older people are aware of the need to engage in relevant protective behaviours. However, delivering individualised services is resource-intensive, and a strong focus on prevention is needed to reduce the long-term costs associated with age-related conditions (Jorm, 2014; Tak, Kuiper, Chorus, & Hopman-Rock, 2013). Ultimately, population-level interventions that aim to prevent the onset of negative psychological conditions, promote self-efficacy, and encourage and

facilitate physical activity may represent more affordable and effective approaches to improving health optimism.

Physical activity presents as a particularly relevant intervention focus because it can be amenable to change in the shorter-term and is recognised as a ‘silver bullet’ that has the potential to prevent and address a wide range of physical and psychological conditions (Netz, Wu, Becker, & Tenenbaum, 2005; Warburton, Nicol, & Bredin, 2006). Of specific relevance to the present study, exercise programs have been found to have positive effects on psychological well-being, quality of life, depression, and self-efficacy (Huang, Liu, Tsai, Chin, & Wong, 2015; Netz et al., 2005; Takkinen, Suutama, & Ruoppila, 2001), indicating that promoting physical activity among older people could have multiple benefits for health optimism. The prescription of physical activity by health practitioners constitutes an affordable and accessible intervention that can avoid the stigma associated with a diagnosis of depression, while also representing a more cost-effective and potentially more efficacious alternative to the prescription of anti-depression medication (Josefsson, Lindwall, & Archer, 2014). An alternative or complementary strategy to increase physical activity is to modify seniors’ environments to facilitate greater physical exertion (King, Rejeski, & Buchner, 1998). The recent trend of installing resistance training equipment in parks is an example of environmental modification that has been found to be motivating for older people (Stride, Cranney, Scott, & Hua, 2017). Even strategies as basic as ensuring neighbourhood footpaths are safe for walking can have a significant effect on seniors’ activity levels (Booth, Owen, Bauman, Clavisi, & Leslie, 2000).

There are likely to exist other forms of healthy ageing interventions that also have the potential to produce positive outcomes for older people across the domains of interest in this study. For

example, participation in volunteering activities has been associated with higher levels of psychological well-being, higher quality of life, lower depression scores, higher self-efficacy, and higher levels of physical activity among older people (Borroni, 2008; Cattan, Hogg, & Hardill, 2011; Greenfield & Marks, 2004; Tan, Xue, Li, Carlson, & Fried, 2006; Thoits & Hewitt, 2001). This suggests that encouraging and facilitating volunteering among those reaching retirement (perhaps using behaviour change techniques as per Warner, Wolff, Ziegelmann, & Wurm, 2014) could constitute an effective method of enhancing health optimism via its positive effects on both the direct and indirect pathways identified in this study.

Given lower levels of health optimism among younger members of the sample, the ‘young old’ may require particular attention in interventions designed to encourage health optimism. However, as noted above, the variables identified in the model are likely to be more efficiently addressed via a preventive orientation that adopts a lifespan approach rather than attempting to introduce changes in later life (Ekelund, 2014; Kuh, Richards, Cooper, Hardy, & Ben-Shlomo, 2014). As such, health policies that aim to optimise health at the population level by promoting mental and physical health at all life stages are likely to constitute the ideal approach to ensuring that people are health optimists by the time they reach older age.

### **Limitations and Strengths**

A primary limitation of the present study is the cross-sectional design, meaning that causality cannot be determined. Building on these findings, longitudinal research is needed to assess whether the identified relationships hold over time and to better clarify the relationships between health optimism and the assessed variables given that these relationships may be reciprocal in nature. Experimental or intervention-based work is encouraged that targets

improvements in one or more ‘predictors’ (e.g., self-efficacy, quality of life, psychological well-being) and tracks any resultant change in health optimism status. A second limitation concerns the measurement of objective health. Although CCIs generated from self-reports have been found to be comparable to data from administrative records in predicting one-year mortality risks (Chaudhry, Jin, & Meltzer, 2005), the self-reported nature of the objective health measure used in the present study may have resulted in bias. Future studies may wish to address this limitation by using a measure of objective health that is not reliant on self-report.

The age and gender characteristics observed in the present sample were generally comparable to those observed in the general population of Western Australian adults aged 60+ years (ABS, 2016). However, as participants were part of a broader study that required them to be sufficiently healthy and mobile to attend an on-campus interview, it is likely that this sample was somewhat skewed towards healthier older adults.

Finally, this research did not examine self-perceptions of ageing. Given evidence suggests that self-perceptions of ageing and ageing self-stereotypes play a role in how older adults view their health (Levy, Slade, & Kasl, 2002; Moor, Zimprich, Schmitt, & Kliegel, 2006), it is possible that these beliefs also influence self-rated health and therefore health optimism. In the future, researchers may wish to examine the role of these variables. A key strength of the present study was the inclusion of an extensive range of sociodemographic, psychosocial, and health factors. This coverage is likely to have contributed to the very large percentages of variance accounted for by the model.

## **Conclusion**

These findings extend the limited evidence on health incongruence in older adults by identifying various modifiable factors that may constitute potential areas of focus for future interventions designed to enhance health outcomes via the fostering of health optimism. The results suggest that improving psychological well-being and quality of life through strategies designed to (i) prevent, identify, and treat depression; (ii) bolster self-esteem and self-efficacy; and (iii) encourage physical activity may reduce the impact of chronic health conditions by improving psychological well-being and/or quality of life, thereby increasing health optimism. Further research is required to test the efficacy of such strategies in terms of both their impact on health optimism and on subsequent health outcomes.

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Table 1: *Correlations between variables*

	Age	Gender	Education	Living status	SES	QoL	PWB	Social support	Depression	Self-esteem	Self-efficacy	BMI	PA	HO
Age	-	-.12*	-.09	-.16	.00	.04	.06	.04	-.04	.05	-.01	-.16***	-.04	.19***
Gender		-	-.14**	-.20***	-.07	.02	.03	.01	.09*	-.11*	-.02	-.01	-.18***	-.10*
Education			-	.09	.13**	.04	.05	.05	-.10*	.14**	.08	-.07	.03	-.03
Living status				-	.18***	.14**	.10*	.25***	-.15**	.10*	.01	.03	.12**	.00
SES					-	.14**	.05	.07	-.11*	.06	.02	-.07	.13**	.00
QoL						-	.55***	.40***	-.53***	.47***	.36***	-.30***	.25***	.19***
PWB							-	.59***	-.68***	.65***	.58***	-.13**	.20***	.19***
Social support								-	-.49***	.53***	.33***	-.14**	.12**	.06
Depression									-	-.63***	-.41***	.20***	-.14**	-.15**
Self-esteem										-	.50***	-.16***	.10*	.13**
Self-efficacy											-	.05	.11*	.09
BMI												-	-.09	-.04
PA													-	.10*
HO														-

*Note.* SES = socioeconomic status; QoL = quality of life; PWB = psychological well-being; BMI = body mass index; PA = physical activity; HO

= health optimism. Gender : 1 = male, 2 = female.

1 Table 2: *Unstandardized and standardized direct effects in the specified model*

Independent Variable	Dependent Variable	b (SE)	B	p-value	Standardized 95% CI
Depression	Psychological well-being	-0.36 (0.05)	<b>-.35</b>	< .001	-0.42, -0.27
	Quality of life	-0.48 (0.10)	<b>-.29</b>	< .001	-0.39, -0.19
Self-efficacy	Psychological well-being	0.53 (0.07)	<b>.26</b>	< .001	0.20, 0.32
	Quality of life	0.46 (0.16)	<b>.14</b>	.005	0.06, 0.23
Social support	Psychological well-being	0.20 (0.03)	<b>.24</b>	< .001	0.18, 0.31
	Quality of life	0.13 (0.07)	.10	.064	0.01, 0.18
Self-esteem	Psychological well-being	0.27 (0.07)	<b>.16</b>	< .001	0.09, 0.24
	Quality of life	0.28 (0.15)	.11	.070	0.01, 0.20
Physical activity	Psychological well-being	0.41 (0.13)	<b>.09</b>	.003	0.04, 0.14
	Quality of life	1.01 (0.28)	<b>.14</b>	< .001	0.08, 0.20
BMI	Psychological well-being	0.00 (0.05)	.00	.964	-0.05, 0.05
	Quality of life	-0.52 (0.12)	<b>-.20</b>	< .001	-0.28, -0.12
Living status	Psychological well-being	-0.50 (0.56)	-.03	.382	-0.08, 0.02
	Quality of life	1.11 (1.26)	.04	.380	-0.03, 0.11
SES	Psychological well-being	N/A	N/A	N/A	N/A
	Quality of life	0.01 (0.01)	.05	.240	-0.02, 0.11
Quality of life	Health optimism	0.02 (0.01)	<b>.26</b>	.001	0.14, 0.39
Psychological well-being	Health optimism	0.03 (0.01)	<b>.21</b>	.014	0.06, 0.35
Age	Health optimism	0.04 (0.01)	<b>.23</b>	.001	0.12, 0.35

2 *Note.* Significant standardized coefficients are presented in bold.

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1 Table 3: *Unstandardized and standardized indirect effects associated with the specified*  
 2 *model*

Indirect pathway	b (SE)	B	p-value	Standardized 95% CI
Physical activity – PWB – HO	0.01 (0.01)	.02	.080	.00, .04
<b>Depression – PWB – HO</b>	<b>-0.01 (0.01)</b>	<b>-.07</b>	<b>.024</b>	<b>-.13, -.02</b>
<b>Self-efficacy – PWB – HO</b>	<b>0.01 (0.01)</b>	<b>.06</b>	<b>.018</b>	<b>.02, .10</b>
<b>Self-esteem – PWB – HO</b>	<b>0.01 (0.00)</b>	<b>.04</b>	<b>.048</b>	<b>.01, .07</b>
<b>Social support – PWB – HO</b>	<b>0.01 (0.00)</b>	<b>.05</b>	<b>.014</b>	<b>.02, .08</b>
BMI – PWB – HO	0.00 (0.00)	.00	.966	-.01, .01
Living status – PWB – HO	-0.01 (0.02)	-.01	.442	-.02, .00
<b>Physical activity – QoL – HO</b>	<b>0.02 (0.01)</b>	<b>.04</b>	<b>.037</b>	<b>.01, .07</b>
<b>Depression – QoL – HO</b>	<b>-0.01 (0.00)</b>	<b>-.07</b>	<b>.019</b>	<b>-.13, -.03</b>
<b>Self-efficacy – QoL – HO</b>	<b>0.01 (0.00)</b>	<b>.04</b>	<b>.031</b>	<b>.01, .07</b>
Self-esteem – QoL – HO	0.01 (0.00)	.03	.125	.00, .06
Social support – QoL – HO	0.00 (0.00)	.03	.101	.00 .05
<b>BMI – QoL – HO</b>	<b>-0.01 (0.00)</b>	<b>-.05</b>	<b>.011</b>	<b>-.09, -.02</b>
SES – QoL – HO	0.00 (0.00)	.01	.278	.00, .03
Living status – QoL – HO	0.02 (0.03)	.01	.436	-.01, .03

3 *Note.* QoL = Quality of life; PWB = Psychological well-being; HO = health optimism;

4 Significant standardized coefficients are presented in bold.

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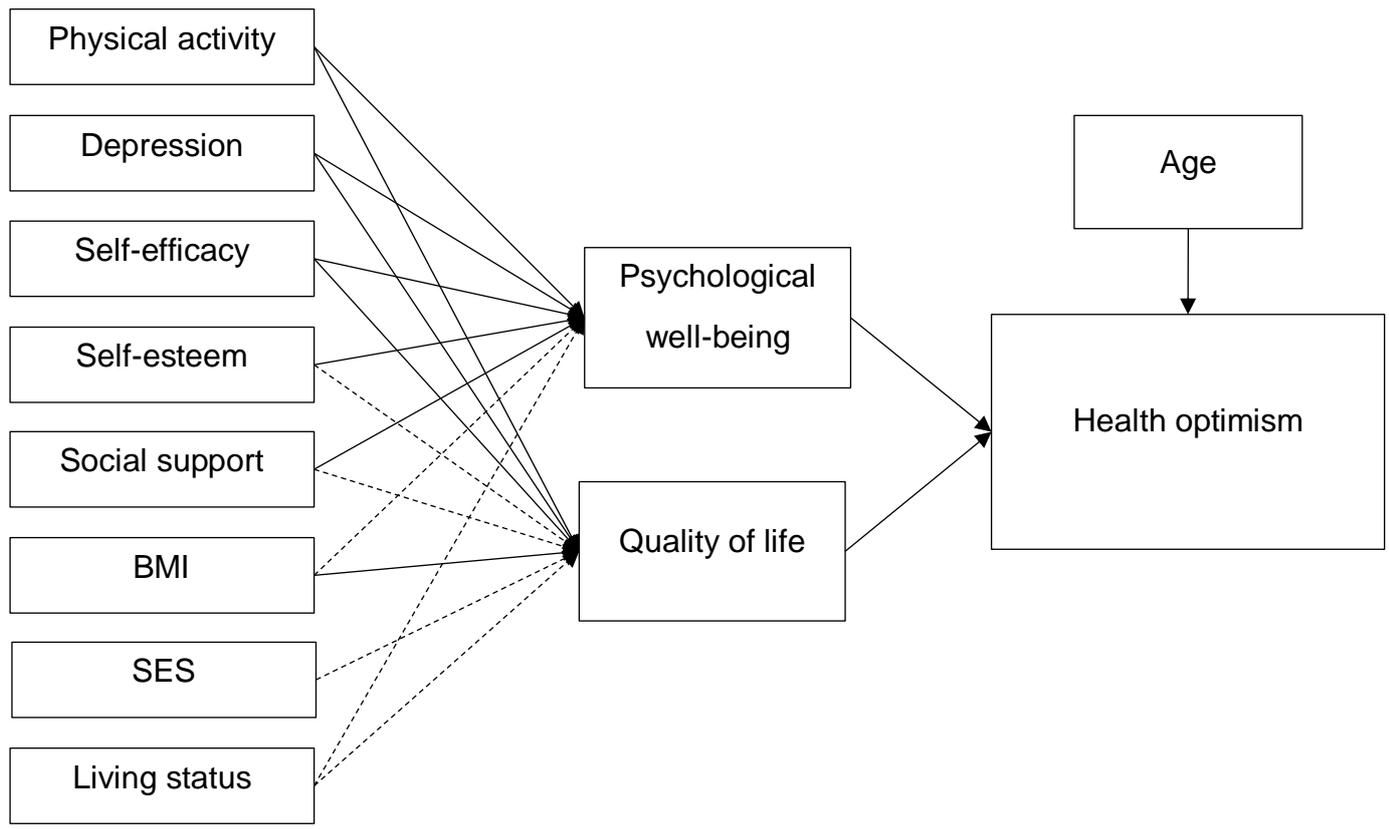


Figure 1. Schematic of the tested model. Broken lines depict non-significant paths

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