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Testing the independence of multiple personality factors in relation to health among community dwelling older men

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Abstract

Objective—We assessed associations between specific personality factors and health, and tested whether specific personality factors were related to health outcomes independent of each other.

Methods—We performed cross-sectional analyses of personality and health among a sample of community-dwelling older men (n=613, mean age=81.4 (SD 5.04)) living in Pittsburgh, PA.

Results—Personality factors (dispositional optimism, conscientiousness, and goal adjustment) were crudely related to both physical and mental health, but adjusting for other personality factors completely attenuated several of these associations. Conscientiousness remained uniquely related to every physical and mental health outcome. Optimism remained uniquely related to all health outcomes, except physical activity (which was more highly related to conscientiousness and goal adjustment). Associations between goal adjustment and probable depression appeared to be explained by conscientiousness and optimism.

Discussion—Correlations among multiple aspects of personality may mask unique associations of specific personality aspects with successful aging.

Keywords

conscientiousness; disability; dispositional optimism; goal adjustment; personality

Dispositional optimism is defined as a general expectation that good rather than bad things will happen in the future (Scheier, Carver, & Bridges, 1994). Despite accumulating evidence that personality factors are related to health outcomes, only limited prior research examines associations between personality and health in aging. Optimism has been linked in several reports to lower mortality risk (Friedman, Kern, & Reynolds, 2010; Goodwin & Engstrom; Terracciano, Lockenhoff, Zonderman, Ferrucci, & Costa, 2008; H. Tindle et al., 2012). In addition, optimism has been prospectively associated with mental (H. Tindle et al., 2012;

Turiano et al., 2012) and physical health outcomes (Kim, Park, & Peterson, 2011; Rasmussen, Scheier, & Greenhouse, 2009; H. A. Tindle et al., 2009).

Other personality factors may also be relevant to health in aging. For example, conscientiousness reflects the tendency to be organized, thorough, and reliable, and is highly conceptually relevant to health behaviors important in late-life. Conscientiousness has been linked to lower blood pressure (Turiano et al., 2012) as well as greater longevity (Friedman & Kern; Kern & Friedman, 2008). Another personality factor of particular health relevance in late-life is goal adjustment, which consists of two separate components that are thought to capture particular types of self-regulation strategies. One component involves goal disengagement (the capacity to disengage from unobtainable goals) and the second component involves goal reengagement (the ability to identify, pursue, and place value in novel goals). Studies have related goal adjustment to subjective well-being (Wrosch, Scheier, Miller, Schulz, & Carver, 2003), as well as self-reported health, diurnal cortisol secretion (Wrosch, Miller, Scheier, & de Pontet, 2007), and C-reactive protein (Miller & Wrosch).

However, no prior research has determined whether these aspects of personality are associated with health outcomes independent of each other. For example, it may be that optimism is only related to health because more optimistic people tend to be more conscientiousness or better at adjusting their goals. Therefore, the current study tested whether these personality factors are related to health status independent of each other (i.e. is optimism related to health status independent of conscientiousness?). We examined a range of physical and mental health outcomes pertinent in late-life because older adults face challenges with not only increased risk of disease but also changing roles/daily activities, disability, and worsening sleep quality.

Methods

Parent study and sample

The Osteoporotic Fractures in Men (MrOS) study enrolled 5994 community-dwelling men beginning in March of 2000, with recruitment divided between six U.S. clinical centers (Birmingham, AL; Minneapolis, MN; Palo Alto, CA; Pittsburgh, PA; Portland, OR; and San Diego, CA). Baseline characteristics (Orwoll et al., 2005) and details of recruitment (Blank et al., 2005) have been described elsewhere. Participants were ambulatory men aged 65 and older who were able to walk without assistance at baseline, did not have a bilateral hip replacement, were able to provide self-report data and informed consent, planned to reside near a clinical center for at least 3 years, and were absent of illness that would, in the judgment of the investigator, result in imminent death. Between March 2009 and April 2011, personality assessments questionnaires and health assessments were mailed to all surviving active study participants at the Pittsburgh site (n=665). The overall response rate at the Pittsburgh site was 95%, and less than 3% of respondents were missing any data, resulting in n=613 who completed personality assessments.

Measures

Personality scales—Questionnaires including four personality assessments were mailed to the men. Cronbach's alpha was used to assess internal consistency for each personality scale. Optimism (OP; total score potential range 0–24; Cronbach's $\alpha = .74$) was measured using the Life Orientation Test – Revised (LOT-R) (Scheier & Carver, 1987; Scheier et al., 1994). Conscientiousness (CO; total score potential range 5 – 50; Cronbach's $\alpha = .79$) was measured using the International Personality Item Pool scales, which has been validated against the conscientiousness scale in the revised NEO Personality Inventory (Goldberg, 1999). Goal disengagement (GAS-DIS; total score potential range 4–20; Cronbach's $\alpha = .61$) and goal reengagement (GAS-RE; total score potential range 6–30; Cronbach's $\alpha = .85$) were measured using Goal Adjustment Scale (which separately measures goal disengagement and reengagement; (Wrosch et al., 2003)).

Health outcomes—Physical health was measured with the following: (1) the presence difficulty with at least one of five instrumental activities of daily living (IADL; walking 2–3 blocks, climbing 10 steps, preparing own meals, doing heavy housework, and shopping); (2) the level of IADL difficulty rating 2 to indicate the presence of at moderate-severe IADL difficulty with the same 5 IADLs from above using the Euro-Quality of Life-5 (Johnson, Coons, Ergo, & Szava-Kovats, 1998)); (3) General self-rated functional health/well-being from the Short Form-12 Physical Health Score (SF-12 score in quartiles; (Ware, Kosinski, & Keller, 1996); and (4) the Physical Activity Scale for the Elderly (PASE in quartiles (Washburn, Smith, Jette, & Janney, 1993).

Mental health was assessed using (1) the Geriatric Depression Scale – 15, a short, validated screen for probable depression in the elderly (using cut off 6; (Almeida & Almeida, 1999); (2) the Pittsburgh Sleep Quality Index (PSQI) a measure of sleep quality validated to detect clinically significant sleep disturbances using a cut-off of greater than 5 (Buysse et al., 1991), and (3) general mental health using the Short Form-12 Mental Health Score (SF-12 in quartiles (Ware et al., 1996).

Demographic and lifestyle covariates—Age, education (less than a high school diploma, high school diploma, or college/graduate school), living alone (vs. not living alone), alcohol use (<1 drink/week, 1–13 drinks/week, or 14+ drinks/week), and smoking status (current, former, or never) were considered demographic/lifestyle covariates.

Statistical Analysis

All personality factors (optimism, conscientiousness, goal disengagement and goal reengagement) were coded as continuous summary scores with higher levels representing a greater presence of the particular personality factor. For example, participants with the highest goal disengagement scores were best at reducing efforts towards a goal when needed. Pearson correlations were used to assess associations among personality factors. Univariate associations between demographic/lifestyle characteristics (as categorical variables) and all personality scores were examined using separate T-Tests or ANOVA. Relationships between health outcomes (as categorical variables) and personality scores were similarly examined.

In the main analysis, separate logistic regression models were used for each of the categorical health outcomes. Ordinal regression was used for health outcomes that were expressed in quartiles (SF-12 Physical Health, SF-12 Mental Health, and PASE) such that odds ratios indicated the odds of being in a lower quartile of the outcome (i.e. $OR < 1$ indicates decreased odds of being in a lower quartile of the outcome). In order to examine the relative contributions of the personality factors, Model 1 included age and each personality factor that was associated with the health outcome of interest (with $p = 0.10$) in the bivariate analyses. In Model 2, demographic/lifestyle covariates that were associated with the included personality factors ($p = 0.10$) were added to Model 1 so that age, multiple personality factors, and covariates were included as predictors of each health outcome. All significance levels reported were two-sided and all analyses were conducted using SAS version 9.3 (SAS Institute Inc., Cary, NC).

Results

Baseline characteristics of the analytic sample are shown in Table 1. Participants averaged 81.4 years old (SD 5.04) and were 98.2% white.

Correlations among Personality Scores

With the exception of goal disengagement and goal re-engagement, all other personality scales had small but statistically significant correlations with each other (Table 2). Goal disengagement was negatively correlated with the other personality factors. The absence of a correlation between goal disengagement and goal reengagement is consistent with prior research (Wrosch et al., 2003).

Demographic and Lifestyle Characteristics and Personality Scores

A number of demographic and lifestyle characteristics were found to be significantly related to personality (Table 3). Men higher in optimism and conscientiousness were younger ($p = 0.04$) and more educated ($p < 0.0001$). Those lower in conscientiousness were more likely to live alone ($p = 0.04$). With respect to smoking status, current smokers had the highest capacity to disengage and those who never smoked had the lowest capacity ($p = 0.009$). A significant non-linear trend was found in the relationship between education and goal reengagement: those with a high school education had lower goal reengagement scores than both those without a high school education and those who attended college ($p = .001$).

Health Outcomes and Personality Scores

Measures of health were statistically associated with almost every personality scale at the bivariate level (Table 4). The only exception was goal-disengagement, which was marginally associated with IADL impairment ($p = 0.06$) and difficulty ($p = 0.08$) and was not associated with the PSQI and SF-12 mental health sub-score. On the other hand, separate logistic regressions (which controlled for the other 3 personality factors, when assessing the effects of the remaining factor) indicated that some of these personality factors were more uniquely associated with these health outcomes than were the others (Table 5).

Each SD increase in optimism and conscientiousness decreased the odds of having any IADL impairment by 32% and 24%, respectively. Neither goal adjustment scale related to IADL impairment after adjustment for optimism and conscientiousness. Each SD increase in optimism and conscientiousness decreased the odds of reported IADL difficult by 35% and 30%, respectively; Goal re-engagement was also associated with 31% reduced odds of IADL difficulty, although goal disengagement was not. The SF-12 physical health sub-scale was also predicted independently by optimism, conscientiousness, and goal-reengagement. The odds of falling in a lower SF-12 quartile decreased by 28%, 26%, and 18% per SD increase in optimism, conscientiousness, and goal-reengagement, respectively.

The odds of being in a lower quartile of the PASE were decreased by 17% per SD increase in conscientiousness and by 37% per SD increase in goal reengagement, while the odds of falling in a lower quartile of the PASE increased by 19% per SD increase in goal disengagement. After accounting for conscientiousness and goal adjustment, optimism was not a significant predictor of the PASE.

The odds of GDS determined depression were reduced by 67% and 56% per respective SD increase in optimism and conscientiousness. The goal adjustment scales were not associated with GDS depression after accounting for optimism and conscientiousness. Optimism was associated with a 26% decrease per SD in the odds of poor sleep, and each SD increase in conscientiousness decreased the odds of poor sleep by 23%. Goal reengagement was marginally related to lower odds of poor sleep ($p=0.06$).

Finally, optimism and conscientiousness decreased the odds of being in a lower SF-12 mental health quartile by 53% and 25% (per SD) respectively, while goal reengagement was not associated with the SF-12 mental health sub-scale.

Discussion

Although associations were found between nearly all personality factors and health at the bivariate level, after accounting for the roles of multiple aspects of personality, several personality-health associations were completely attenuated. Conscientiousness was the only personality factor independently related to all of the health outcomes examined. Optimism was also independently related to all factors except physical activity. Goal adjustment capacities, especially reengagement, were independently associated with self-rated physical health and activity. Finding that conscientiousness was uniquely related to every health outcomes examined indicates the uniqueness and importance of this aspect of psychological functioning.

Our results also indicated that optimism was not uniquely related to physical activity (the PASE) after multi-personality predictor variable adjustments. Levels of conscientiousness and goal adjustment were the best predictors of physical activity. Indeed, goal reengagement emerged as a potential unique, physical-health protective factor. Increases in goal-reengagement were related to decreased odds of worse SF-12 physical health and physical activity (PASE) outcomes. These associations are independent of optimism and conscientiousness and offer empirical support for intuitive notions of the role of goal

adjustment: those with a greater proclivity to disengage from unattainable goals tended to have lower levels of physical activity (perhaps owing to perceptions in this age group that a high level of physical activity is something that they will not be able to maintain), whereas those better at identifying new goals (reengagement) had higher levels of physical activity (perhaps because the attraction of valued new activities spurred them on). It is noteworthy that the finding with respect to increased physical activity is consistent with other research on women with breast cancer (Wrosch & Sabiston, 2013).

On the other hand, goal adjustment was not independently associated with mental health outcomes in multivariable models indicating that associations at the bivariate level may be due in this sample to shared variance with optimism or conscientiousness. Since physical activity is well recognized as a key health determinant, longitudinal research is needed to assess the etiological role of goal adjustment in preserving high levels of activity throughout aging, and interventions can also test whether goal adjustment strategies can be beneficially taught to older adults.

Strengths of our study include the novel examination of multiple aspects of personality in relation to a wealth of health outcome data highly relevant to quality of life for the rapidly aging global population (Cauley, 2013). To our knowledge disability and sleep disturbances have not been previously examined in relation to the personality factors considered here. In addition, our paper presents novel associations between the personalities factors studied: as optimism increases, so did conscientiousness and goal reengagement capacity. Goal disengagement was the only factor to have a negative correlation with the other personality factors, as well as with physical activity levels. This raises the possibility that the adaptive value of greater disengagement capacity dissipates in later-life such that goal disengagement by be no longer protective or even deleterious.

Limitations to our study should also be noted. The cross-sectional nature of our data eliminates the possibility of causal inference, leaving open questions of whether initial levels of health or personality factors drive our findings. Future research should assess if personality impacts changes in functional status over time. Our sample was made up of community-dwelling older men that were mostly white, therefore these findings do not necessarily generalize to younger people, women, non-white individuals, or institutionalized populations.

Our findings draw attention to the complex nature of personality and health in aging that requires future research to understand the mechanisms relating personality to health over time. Some previous research linking optimism prospectively with mortality risk made statistical adjustments for factors like self-reported health, chronic disease, and physical activity (Friedman et al., 2010; Terracciano et al., 2008). These adjustments are designed in part to exclude the possibility of reverse causation (i.e. poor health leading to both lower optimism at baseline and increased future mortality risk). Sleep disturbances and IADL impairment/difficulties, however, have not been statistically controlled in any previous analysis of personality and mortality. Optimism was associated with both IADL impairment and sleep disturbance outcomes in our sample. Since both IADL impairment and sleep disturbances have been associated with increased mortality risk (Bowling et al., 2012;

Cappuccio, D'Elia, Strazzullo, & Miller, 2010), these health factors may represent key mediators in the relationship between optimism/conscientiousness and mortality.

In conclusion, while associations were detected at the bivariate level between almost all of the personality factors and health outcomes studied. Further analyses revealed that some personality factors were not uniquely associated with these outcomes after simultaneously considering other aspects of personality. Specifically, the relationship between optimism with physical activity appeared to be due to shared variance with conscientiousness and goal adjustment, while the association of goal adjustment with depressive symptomatology appeared to be due to shared variance with conscientiousness and optimism.

Future research should routinely include measures of different personality factors in the same study, in order to determine which aspects of personality are most relevant for health and well-being. This is especially important when each of the personality factors in question has been shown to be an important predictor of health in isolation of other factors. Given the important role of personality in health, future work is needed to examine the development and persistence of protective personality factors across the lifespan, to study if the adaptive value of some characteristics might change over time, and to determine whether interventions targeting specific areas of psychological functioning can modify levels of personality factors to improve health and related quality of life.

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Table 1**Baseline characteristics of sample (N=613)**

Age	81.4 +/- 5.04
White Race	602 (98.21)
Education	
Less than high school	61 (9.95)
High school diploma	250 (40.78)
College/Graduate school	302 (49.27)
Lives alone	125 (20.39)
Alcohol use (drinks per week)	
<1	391 (63.78)
1–13	202 (32.95)
14+	20 (3.26)
Smoking status	
Current	15 (2.45)
Former	371 (60.52)
Never	227 (37.03)
Physical Health Outcomes	
1 or more IADL	242 (39.61)
IADL Difficulty 2	183 (29.95)
SF-12 – Physical Score	44.70 +/- 12.01
PASE Score	127.58 +/- 77.49
Mental Health Outcomes	
Geriatric Depression Scale (GDS) 6	78 (12.81)
Poor Subjective Sleep Quality	271 (44.28)
SF-12 – Mental Score	54.58 +/- 7.88
Total LOT-R Score	15.35 +/- 3.76
Optimism score	15.35 +/- 3.76
Conscientiousness score	36.83 +/- 6.48
Goal disengagement score	11.47 +/- 2.79
Goal reengagement score	20 +/- 4.06

mean +/- SD or N(%) shown

Table 2

Correlations among personality scale scores

	Optimism (OP)	Conscientiousness (CO)	Goal Disengagement (GA-DIS)	Goal Reengagement (GA-RE)
Optimism (OP)	-	0.27 **	-.15 *	0.22 **
Conscientiousness (CO)	0.27 **	-	-.23 **	.23 **
Goal Disengagement (GA-DIS)	-.15 *	-.23 **	-	-.08
Goal Reengagement (GA-RE)	0.22 **	.23 **	-.08	-

*
p < .001;**
p < .0001

Table 3

Mean personality scale scores by demographic and lifestyle characteristics

	OP		CO		GA-DIS		GA-RE	
	p		p		p		p	
Age								
<77	15.94 +/- 3.74	0.04	37.47 +/- 7.13	0.01	11.62 +/- 2.82	0.52	20.17 +/- 3.84	0.69
77- <81	15.69 +/- 3.92		37.98 +/- 6.2		11.2 +/- 2.71		19.96 +/- 3.98	
81- <85	15.14 +/- 3.76		36.36 +/- 6.47		11.55 +/- 2.92		20.21 +/- 4.27	
85+	14.77 +/- 3.53		35.6 +/- 6.04		11.57 +/- 2.71		19.7 +/- 4.12	
Education								
Less than high school	14.58 +/- 3.56	<0.0001	34.63 +/- 6.23	0.01	11.48 +/- 2.75	0.75	20.38 +/- 3.79	0.001
High school diploma	14.70 +/- 3.79		36.72 +/- 6.32		11.57 +/- 2.57		19.26 +/- 4.03	
College/Graduate school	16.04 +/- 3.65		37.34 +/- 6.58		11.38 +/- 2.96		20.53 +/- 4.06	
Lives alone								
Yes	15.22 +/- 3.68	0.66	35.74 +/- 6.52	0.04	11.79 +/- 2.8	0.16	19.55 +/- 4.42	0.17
No	15.38 +/- 3.78		37.1 +/- 6.44		11.39 +/- 2.78		20.12 +/- 3.96	
Alcohol use (drinks per week)								
<1	15.31 +/- 3.96	0.55	36.47 +/- 6.65	0.14	11.43 +/- 2.87	0.059	19.84 +/- 4.2	0.10
1-13	15.34 +/- 3.40		37.58 +/- 6.07		11.39 +/- 2.6		20.43 +/- 3.63	
14+	16.25 +/- 3.26		36.17 +/- 6.76		13 +/- 2.66		18.72 +/- 5.31	
Smoking status								
Current	14.64 +/- 2.62	0.44	35.92 +/- 5.19	0.80	12.69 +/- 2.29	0.009	20.31 +/- 2.43	0.65
Former	15.50 +/- 3.67		36.94 +/- 6.39		11.68 +/- 2.76		20.11 +/- 3.93	
Never	15.16 +/- 3.96		36.7 +/- 6.7		11.06 +/- 2.82		19.81 +/- 4.35	

Mean +/-SD shown;

Note: OP - optimism score; co - conscientiousness; GA-DIS - goal disengagement; GA-RE - goal re-engagement

Table 4

Mean personality scale scores by physical and mental health outcomes

	OP		CO		GA-DIS		GA-RE	
	p		p		p		p	
Physical Health								
IADL impairments								
1	14.26 +/- 3.72	<.0001	35.21 +/- 6.86	<.0001	11.73 +/- 2.66	0.06	19.32 +/- 4.22	0.001
0	16.06 +/- 3.62		37.88 +/- 6		11.29 +/- 2.86		20.44 +/- 3.91	
IADL difficulty								
2	13.95 +/- 3.75	<.0001	34.48 +/- 6.8	<.0001	11.77 +/- 2.67	0.08	18.93 +/- 4.17	<.0001
<2	15.95 +/- 3.61		37.81 +/- 6.09		11.33 +/- 2.83		20.46 +/- 3.94	
SF-12 – Physical Score								
Quartile 1: 12.8 <= and < 35.9	14.03 +/- 3.81	<.0001	35.1 +/- 6.96	<.0001	11.8 +/- 2.71	0.03	18.73 +/- 4.23	<.0001
Quartile 2: 35.9 <= and < 47.8	14.9 +/- 3.81		35.53 +/- 6.07		11.77 +/- 2.71		20.01 +/- 4.29	
Quartile 3: 47.8 <= and < 56.2	16.14 +/- 3.18		37.64 +/- 5.9		11.39 +/- 2.57		20.03 +/- 3.38	
Quartile 4: 56.2 <= and < 64.5	16.63 +/- 3.83		39.14 +/- 6.19		10.96 +/- 3.05		21.05 +/- 3.96	
PASE								
Quartile 1: 0 <= and < 70	14.35 +/- 3.81	0.001	34.31 +/- 6.63	<.0001	12.16 +/- 2.65	0.002	18.34 +/- 4.48	<.0001
Quartile 2: 70 <= and < 122.1	15.32 +/- 3.69		36.65 +/- 6.47		11.62 +/- 2.83		19.61 +/- 3.94	
Quartile 3: 122.1 <= and < 173.2	15.78 +/- 3.67		38.02 +/- 6.19		11.26 +/- 2.67		20.49 +/- 3.46	
Quartile 4: 173.2 <= and < 483.5	15.93 +/- 3.69		38.13 +/- 5.98		10.88 +/- 2.86		21.43 +/- 3.73	
Mental Health								
Geriatric Depression Scale (GDS)								
6	12.03 +/- 3.66	<.0001	31.83 +/- 6.59	<.0001	12.09 +/- 2.73	0.04	18.15 +/- 4.62	<.0001
<6	15.84 +/- 3.53		37.54 +/- 6.16		11.38 +/- 2.79		20.27 +/- 3.92	
PSQI								
>5	14.63 +/- 3.68	<.0001	35.53 +/- 6.33	<.0001	11.49 +/- 2.63	0.89	19.43 +/- 4.03	0.0027
5	15.91 +/- 3.73		37.82 +/- 6.42		11.45 +/- 2.91		20.44 +/- 4.04	
SF-12 – Mental Score								
Quartile 1: 12.4 <= and < 51.1	13.38 +/- 3.54	<.0001	34.42 +/- 6.8	<.0001	11.54 +/- 2.64	0.48	18.81 +/- 4.4	<.0001
Quartile 2: 51.1 <= and < 57.2	15.2 +/- 3.75		36.57 +/- 5.7		11.61 +/- 2.78		19.98 +/- 3.83	

	OP	CO	GA-DIS	GA-RE
	p	p	p	p
Quartile 3: 57.2 ≤ and < 59.8	16.25 +/- 3.26	38.25 +/- 6.19	11.6 +/- 2.48	20 +/- 3.76
Quartile 4: 59.8 ≤ and < 67.4	16.81 +/- 3.75	38.2 +/- 6.55	11.16 +/- 3.16	21.02 +/- 3.98

Mean +/-SD shown;

Note: OP - optimism score; co - conscientiousness; GA-DIS - goal disengagement; GA-RE - goal re-engagement

Table 5

Odds ratios (95% CI) for health outcomes per standard deviation increase in personality factors: model 1 (age adjusted) and model 2 (model 1 + adjustments for selected health-relevant characteristics).

Health Outcome (Model)	OP		CO		GA-DIS		GA-RE	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
IADL impairment (1)	0.69 (0.56–0.83)	0.0001	0.75 (0.62–0.91)	0.004	1.02 (0.85–1.23)	0.84	0.87 (0.72–1.05)	0.14
IADL impairment (2) †	0.68 (0.56–0.83)	0.0001	0.76 (0.62–0.92)	0.006	1.00 (0.83–1.22)	0.97	0.88 (0.73–1.07)	0.20
IADL difficulty (1)	0.66 (0.54–0.82)	0.0001	0.70 (0.57–0.86)	0.0008	0.99 (0.81–1.21)	0.93	0.79 (0.64–0.96)	0.02
IADL difficulty (2) †	0.65 (0.53–0.81)	<0.0001	0.70 (0.57–0.87)	0.001	0.99 (0.80–1.21)	0.89	0.79 (0.65–0.97)	0.02
SF-12 Physical (1)	0.71 (0.60–0.84)	<0.0001	0.73 (0.62–0.87)	0.0004	1.08 (0.92–1.27)	0.34	0.80 (0.68–0.95)	0.01
SF-12 Physical (2) †	0.72 (0.60–0.85)	<0.0001	0.74 (0.62–0.88)	0.0006	1.09 (0.93–1.29)	0.30	0.82 (0.69–0.97)	0.02
PASE (1)	0.93 (0.80–1.10)	0.40	0.83 (0.71–0.98)	0.03	1.23 (1.05–1.44)	0.01	0.63 (0.54–0.74)	<0.0001
PASE (2) †	0.95 (0.81–1.11)	0.52	0.83 (0.71–0.98)	0.03	1.19 (1.01–1.39)	0.03	0.63 (0.53–0.74)	<0.0001
GDS (1)	0.34 (0.24–0.48)	<0.0001	0.43 (0.31–0.60)	<0.0001	1.00 (0.73–1.36)	0.98	0.87 (0.65–1.16)	0.33
GDS (2) †	0.33 (0.23–0.48)	<0.0001	0.44 (0.32–0.61)	<0.0001	0.97 (0.71–1.33)	0.86	0.89 (0.66–1.20)	0.43
PSQI (1)	0.76 (0.63–0.91)	0.003	0.78 (0.65–0.94)	0.007	*	*	0.86 (0.71–1.03)	0.09
PSQI (2) ●	0.74 (0.62–0.9)	0.002	0.77 (0.64–0.93)	0.006	*	*	0.84 (0.70–1.01)	0.06
SF-12 Mental (1)	0.58 (0.49–0.69)	<0.0001	0.75 (0.63–0.89)	0.0008	*	*	0.88 (0.74–1.04)	0.13
SF-12 Mental (2) ●	0.57 (0.48–0.68)	<0.0001	0.75 (0.63–0.89)	0.0008	*	*	0.87 (0.73–1.03)	0.11

Model 1: includes all personality factors with OR displayed plus age;

Model 2: † = model 1 + education, living alone, alcohol consumption, smoking status;

● = model 1 + education, living alone, alcohol consumption.

* =GA-DIS was not associated with PSQI and SF-12 Mental at bivariate level and was not entered into multivariable regressions

OP - optimism score; co - conscientiousness; GA-DIS - goal disengagement; GA-RE - goal reengagement