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Taylor & Francis Group

Psychology & Health

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/gpsh20

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To cite this article: Emmi Reinilä, Tiia Kekäläinen, Marja-Liisa Kinnunen, Milla Saajanaho & Katja Kokko (28 Sep 2023): Longitudinal associations between emotional well-being and subjective health from middle adulthood to the beginning of late adulthood, Psychology & Health, DOI: 10.1080/08870446.2023.2261038

To link to this article: https://doi.org/10.1080/08870446.2023.2261038

Published online: 28 Sep 2023.

PSYCHOLOGY & HEALTH
https://doi.org/10.1080/08870446.2023.2261038

Longitudinal associations between emotional well-being and subjective health from middle adulthood to the beginning of late adulthood

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ABSTRACT

Objective: Emotional well-being may predict future health and vice versa. We examined the reciprocal associations between emotional well-being and subjective health from age 36 to 61.

Methods and Measures: The data were drawn from the Jyväskylä Longitudinal Study of Personality and Social Development and included information from 36-, 42-, 50- and 61-year-olds ($N = 336$). The emotional well-being indicators included life satisfaction and negative and positive mood. The subjective health indicators were self-rated health and psychosomatic symptoms. The analyses were conducted with random intercept cross-lagged panel models.

Results: Within-person cross-lagged associations were found between emotional well-being and subjective health. Fewer psychosomatic symptoms at ages 36 and 50 predicted higher life satisfaction at ages 42 and 61, respectively. A lower negative mood at age 42 and a higher positive mood at age 50 predicted fewer psychosomatic symptoms at 50 and 61, respectively. Conversely, a higher negative mood at ages 36 and 50 predicted better self-rated health at ages 42 and 61, respectively.

Conclusion: The relationship between emotional well-being and subjective health appears to be reciprocal. Both emotional well-being and subjective health predicted each other even 6–11 years later. However, associations may depend on the variables and age periods investigated.

ARTICLE HISTORY
Received 4 July 2023
Accepted 15 September 2023

KEYWORDS
Life satisfaction; positive mood; negative mood; self-rated health; psychosomatic symptoms; random intercept cross-lagged panel model

Introduction

In terms of the causal associations between emotional well-being and health, the previous literature has found evidence suggesting both directions. Emotional well-being may directly influence health through physiological changes (e.g. changes in cardiovascular and immune systems), indirectly through health-related behaviour (e.g.

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physical activity and diet) or by buffering stress in challenging situations (Boehm & Kubzansky, 2012; DeSteno et al., 2013; Pressman & Cohen, 2005). Nevertheless, diverse life circumstances, such as changes in health, may influence how happy or satisfied people are (Diener, 1984; Diener et al., 1999). Thus, maintaining good health could be beneficial for emotional well-being.

In this study, we sought to investigate reciprocal longitudinal associations between emotional well-being and subjective health in Finnish adults followed from middle adulthood (age 36) to the beginning of late adulthood (age 61). Emotional (i.e. hedonic) well-being includes individuals' emotional responses and cognitive evaluations of satisfaction with life (Diener et al., 1999). Subjective health describes an individual's experience of their health and is often measured with a single item (i.e. self-rated health) or symptom checklists (Cross & Pressman, 2017). In this study, indicators of emotional well-being included both cognitive (i.e. life satisfaction covering multiple domains of life, such as work and social relations) and affective (i.e. positive and negative mood) aspects (Kokko et al., 2013, 2015), and those of subjective health included self-rated health and psychosomatic symptoms (Kekäläinen et al., 2020; Kinnunen et al., 2005).

Longitudinal links between emotional well-being and subjective health

Previous longitudinal research has investigated both unidirectional and bidirectional associations between emotional well-being and subjective health during adulthood. Studies investigating the unidirectional associations, with nearly 20 years of follow-up, have found that higher life satisfaction and positive affect and lower negative affect predicted better self-rated health in 24–79-year-olds (Willroth et al., 2020) and better self-rated physical health in those over 50 years old (Kesavayuth et al., 2022). Furthermore, during a 20-year follow-up, better self-rated health was linked to higher life satisfaction in 33–92-year-old men (Mroczek & Spiro, 2005) and positive affect in those over 62 years old (Gana et al., 2015).

Some studies have included both pathways in their investigation of the longitudinal links between emotional well-being and subjective health during middle and late adulthood. In a study investigating 20–75-year-olds, self-rated health predicted positive and negative affect, but positive and negative affect also predicted future self-rated health 18 years later (Wiese et al., 2019). In contrast, in a study that followed 64–97-year-olds for eight years, better health (including self-rated health) was linked to higher subsequent life satisfaction, but life satisfaction did not predict future health (Gana et al., 2013). However, in a three-year follow-up study of 17–95-year-olds, cross-lagged associations were lacking between emotional well-being indicators (i.e. positive and negative affect and life satisfaction) and self-rated health, but they were observed to change together. This finding supports the dynamic link between emotional well-being and health (Hudson et al., 2019).

Investigating reciprocal associations

Traditional cross-lagged panel models, which are used to investigate reciprocal associations, do not differentiate whether the observed relationships occur between and/

or within individuals (Hamaker et al., 2015). Consequently, the associations in these models may represent the rank-order stability between individuals and may lead to biased conclusions about the presence and sign of (causal) associations (Hamaker et al., 2015; Mulder & Hamaker, 2021). This is noteworthy since both emotional well-being and subjective health are subjective in nature, and there can be stable differences between individuals in how they experience and evaluate their well-being and health. For example, socioeconomic status has been found to be associated with reporting differences in self-reported health measures (Dowd & Todd, 2011).

Thus, it is important to separate stable differences between individuals (trait) from within-person processes (state). Separating these two levels may provide a more nuanced understanding of the underlying mechanism and temporal associations between emotional well-being and subjective health. The associations may be similar, contradictory or exist only at the within- or between-person level. For example, analyses based on the traditional cross-lagged panel model suggested that subjective health predicts emotional well-being and vice versa; however, when the stable differences between individuals were taken into account (random intercept cross-lagged panel model [RI-CLPM]), all prospective associations diminished. Instead, it was revealed that changes in health were correlated with simultaneous changes in emotional well-being (Hudson et al., 2019). Different aspects of emotional well-being may also be variously linked to subjective health between and within individuals. Schenk et al. (2017) found that negative affect was a more important predictor of somatic symptoms at the between-person level, while positive affect was a stronger predictor of symptom variation at the within-person level.

Although previous longitudinal studies investigating the bidirectional relationship between emotional well-being and subjective health from middle to late adulthood have used large national samples, their data analysis was conducted with a wide age range of participants (e.g. the baseline age ranged from 20 to 75 in Wiese et al. [2019]) in one sample. However, the associations between the variables could change during adulthood. For example, older individuals may differ from younger individuals in terms of health assessment since they may expect some health problems to appear with age (Jylhä, 2009). In addition, the predictive power of emotional well-being or health may change during adulthood (Schöllgen et al., 2016; Spuling et al., 2015). Thus, we find it worthy to investigate the same individuals (the baseline age was about 36 in this study) from middle adulthood to the beginning of late adulthood to examine whether the associations vary across the stages of adulthood.

The present study

The present study aimed to examine the reciprocal and within-person longitudinal associations between multiple indicators of emotional well-being (i.e. life satisfaction and positive and negative mood) and subjective health (i.e. self-rated health and psychosomatic symptoms). More specifically, we investigated whether earlier emotional well-being or subjective health predicted later subjective health or emotional well-being between the ages of 36, 42, 50 and 61. We used the RI-CLPM (Hamaker et al., 2015), which enabled the investigation of the reciprocal associations between these two

constructs on the within-person level. In other words, the RI-CLPM enabled us to differentiate the time-invariant, trait-like differences between persons from within-person dynamics (i.e. individual fluctuations). This could help in considerations of whether previously observed associations between emotional well-being and subjective health reflected mainly trait-like differences between individuals or whether the links could also be generalised to the individual level (i.e. whether an individual's emotional well-being or subjective health could be improved by increasing their subjective health or emotional well-being).

Since the correlational relationship between emotional well-being and health has been relatively well established (e.g. Howell et al., 2007; Ngamaba et al., 2017), we first hypothesised that at the between-person level, individuals with higher emotional well-being (i.e. higher life satisfaction and positive mood and lower negative mood) would also report better health (i.e. better self-rated health and fewer psychosomatic symptoms). Concerning the within-person associations, we hypothesised that similar to the between-person level, higher emotional well-being or better subjective health at the earlier measurement wave would predict better subjective health or higher emotional well-being at the later measurement wave. This hypothesis is based on Wiese et al. (2019), who used the RI-CLPM in their nearly 20-year follow-up. Although these previous studies did not investigate the associations between psychosomatic symptoms and the emotional well-being indicators, we expected these associations to be parallel to the previously observed associations between self-rated health and emotional well-being.

Methods

Participants

This study utilised data from the Jyväskylä Longitudinal Study of Personality and Social Development (JYLS), which was initiated in 1968 (Pulkkinen, 2017). In the first data collection in 1968, 369 eight-year-old children (born mostly in 1959) from 12 randomly selected school classes from the town of Jyväskylä, Finland, participated in the study (with an initial participation rate of 100%) (Pulkkinen, 2017, p. 17). Since then, there have been six main data collection phases. In this study, data relating to the 36- (conducted in 1995), 42- (2001), 50- (2009) and 61-year-olds (2020–2021) were utilised. The data collection phases, which involved medical examinations, were ethically approved by the Ethical Committee of the Central Finland Health District (Nos. 42/2000 and 10E/2008) and the Ethical Committee of the University of Jyväskylä (December 13, 2019). The participants provided written informed consent to participate in the study in each data collection phase (Pulkkinen, 2017, p. 21). The samples of the data collection phases conducted during adulthood have represented relatively well the Finnish age cohort born in 1959 (Kokko et al., 2023; Pulkkinen, 2017, p. 20). In the most recent follow-up, women were more likely to have a higher level of vocational education, and men had more children and were more often married (Kokko et al., 2023).

The data used in this study were collected through mailed Life Situation Questionnaires (LSQ) (at ages 36–61), psychological interviews with self-report

inventories (at ages 36–42) and health examinations (at ages 42–61). Participants who offered information about emotional well-being and/or subjective health at least once at age 36, 42, 50 or 61 were included in the study ($N = 336$; women $n = 155$, men $n = 181$). Of these 336 participants, 192 (57%) participated in all 4 data collection phases, 61 (18%) in 3, 41 (12%) in 2 and 42 (13%) in 1 phase between the ages of 36 and 61. Until the most recent phase of data collection at age 61, 28 participants (8% of the initial sample) had died and 37 (10%) had withdrawn their consent to participate.

Measures

Emotional well-being was measured based on life satisfaction and positive and negative mood (Kokko et al., 2013). Life satisfaction consisted of seven items, through which the participants assessed their satisfaction with different areas of life (choice of occupation, financial situation, the content of leisure time, housing, present intimate relationship or lack thereof, present occupational situation, and present state of friendships) (Kokko et al., 2013). The four-point response scale ranged between 1 = *very dissatisfied* and 4 = *very satisfied*. Overall life satisfaction was computed by calculating the mean score for the seven items. Cronbach's alphas ranged from .55 (age 36) to .68 (age 61). Positive and negative mood were measured using the Brief Mood Introspection Scale (Feldman, 1995; Mayer & Gaschke, 1988). The participants assessed their current mood with seven items, two of which represented positive mood (e.g. 'My present mood is happy') and five of which represented negative mood (e.g. 'My present mood is sad') (Kokkonen, 2001). The response scale ranged from 1 = *describes my mood not at all* to 4 = *describes my mood very well*. The mean scores for positive (two items) and negative mood (five items) were computed. Cronbach's alphas ranged from .79 (age 61) to .84 (age 42) and .64 (age 42) to .78 (age 36) for positive and negative mood, respectively.

Subjective health was measured using self-rated health and psychosomatic symptoms (Kinnunen et al., 2005). Self-rated health was measured with the question, 'What has your state of health been during the past year?' The five-point response scale ranged from 1 = *excellent* to 5 = *extremely poor*. The response scale was reversed in the analyses so that higher values would represent better health. Psychosomatic symptoms were assessed with 19 items concerning experienced psychological and physical symptoms (e.g. headache, tiredness and weakness and muscular pain) based on the Health Symptoms Checklist (Aro, 1988). The participants assessed how often they had had symptoms during the last six months. The response scale varied from 1 = *never* to 4 = *very often*. They were asked not to count symptoms regularly associated with menstruation, pregnancy and hangover. A mean score of 19 items was computed, and Cronbach's alphas ranged from .80 (age 50) to .83 (age 42). Cronbach's alphas have been reported in the previous JYLS-based studies for the emotional well-being indicators (Kokko et al., 2013, 2015) and psychosomatic symptoms (Kekäläinen et al., 2020; Kinnunen et al., 2008) at ages 36, 42 and 50.

Information about the participants' gender and education was used as between-person covariates. Gender and education were dichotomous variables (gender:

0 = woman, 1 = man; level of vocational education: 0 = vocational courses or less, 1 = vocational school, vocational college or polytechnic or university). Of the 336 participants, 46% were women and 54% were men and 78% had completed at least vocational school.

Statistical analysis

Descriptive analyses, including means, standard deviations, Pearson correlation tests and paired-samples *t* tests, were conducted with IBM SPSS 28. We used the Mplus statistical package (version 8.2) in the main analyses (Muthén & Muthén, 2017). The longitudinal associations between emotional well-being and subjective health were investigated with the RI-CLPM (Hamaker et al., 2015; Mulder & Hamaker, 2021) (Figure 1). Through four measurement waves (a total of six models), we conducted separate models for the three indicators of emotional well-being and the two indicators of subjective health. The analyses were carried out according to Mulder and Hamaker (2021). With the RI-CLPM, we were able to investigate the reciprocal associations between emotional well-being and subjective health while differentiating the between-person differences from the within-person process (Hamaker et al., 2015). In the RI-CLPM, between-person variance was captured by the random intercepts, and thus, it was possible to investigate the cross-lagged associations at the within-person level. We investigated the cross-lagged paths from emotional well-being to subjective health (a1–a3) and from subjective health to emotional well-being (b1–b3) between the ages of 36, 42, 50 and 61. In addition, we examined the within-person correlation between the emotional well-being and subjective health variables at age 36 (r2) and the correlated change (i.e. correlated residuals) (r3–r5) between the variables. At the between-person level, we investigated the time-invariant, trait-like association between the random intercepts of emotional well-being and subjective health (r1) while

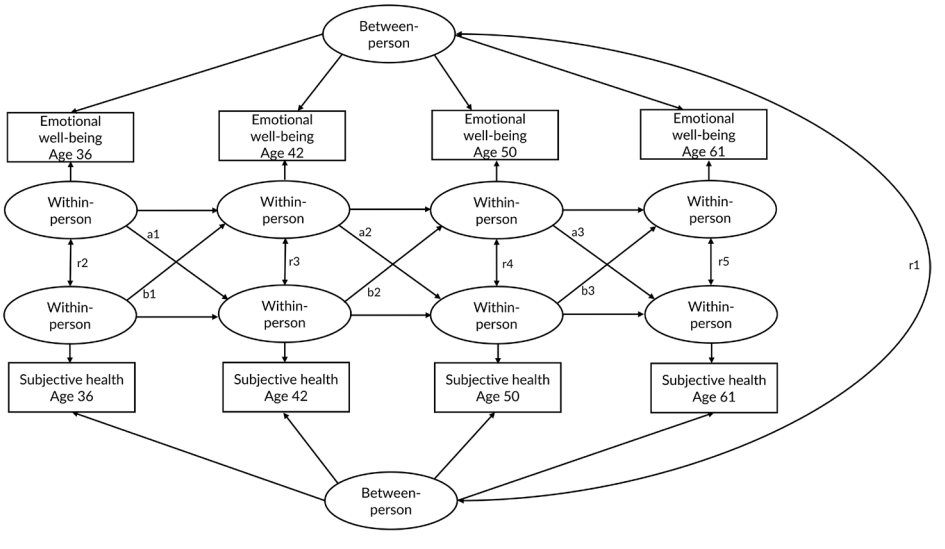

Figure 1. Simplified RI-CLPM of the associations between emotional well-being and subjective health.

controlling for time-invariant gender and education. Autoregressive paths for the emotional well-being and subjective health variables were included in the models to control the preceding deviations in the variable being predicted, but these paths were not reported in the present study.

The model fit of the RI-CLPMs was evaluated with the chi-square test, the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). Acceptable model fit was indicated if the chi-square test values were statistically nonsignificant ($p > .05$), CFI values > .95 and RMSEA values < .08 (Schermelleh-Engel et al., 2003; Schreiber et al., 2006).

Results

Descriptive results

The descriptive information of the study variables, including the means, standard deviations and correlations, are shown in Table 1. As assumed, better self-rated health correlated positively, and psychosomatic symptoms negatively, with life satisfaction and positive mood and conversely with negative mood. The correlations between emotional well-being and the subjective health variables were at most moderate but mainly weak. Rank-order stability between the time points was highest for the psychosomatic symptoms ($r = .63–.67$) and lowest for positive mood ($r = .33–.38$). As previously reported in JYLS-based studies of the emotional well-being indicators, life satisfaction increased and negative mood decreased from ages 36 to 42 (Kokko et al., 2013). Between the ages of 50 and 61, life satisfaction and negative mood increased and positive mood decreased (Reinilä et al., 2023). No statistically significant changes were observed in psychosomatic symptoms from ages 36 to 50 (Kekäläinen et al., 2020; Kinnunen et al., 2008) and self-rated health from ages 42 to 50 (Kekäläinen et al., 2020). There are no previous JYLS-based reports of average trends for self-rated health between ages 36 and 42 and 50 and 61 or symptoms between ages 50 and 61. Self-rated health decreased from ages 36 to 42 ($t(df) = 3.70$ (258), $p < .001$). There was no significant change in self-rated health ($t(df) = -0.44$ (199), $p = .661$) or symptoms ($t(df) = 0.07$ (190), $p = .942$) from ages 50 to 61.

Longitudinal associations between emotional well-being and subjective health

The longitudinal associations between the emotional well-being and subjective health variables were investigated using RI-CLPMs, which showed an acceptable fit to the data (Table 2). The results showed that on the between-person level, individuals with higher life satisfaction and positive mood generally reported better health (life satisfaction: $p = .001$; positive mood: $p < .001$) and fewer psychosomatic symptoms (life satisfaction: $p = .003$; positive mood: $p = .004$). Similarly, individuals with lower negative mood had better self-rated health ($p < .001$) and fewer psychosomatic symptoms ($p = .001$).

Within-person cross-lagged associations were found from emotional well-being to subjective health and vice versa. Deviations from one's expected level of psychosomatic symptoms at ages 36 and 50 predicted deviations from one's expected level

Table 1. Means (M), standard deviations (SD) and correlations of the study variables.

	n	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. LS36	311	3.02	0.36	1																		
2. LS42	279	3.08	0.40	.54*	1																	
3. LS50	263	3.08	0.39	.38*	.52*	1																
4. LS61	206	3.18	0.40	.26*	.43*	.57*	1															
5. PM36	283	2.74	0.62	.40*	.39*	.27*	.13	1														
6. PM42	243	2.82	0.67	.34*	.42*	.37*	.23*	.35*	1													
7. PM50	217	2.91	0.61	.21*	.24*	.46*	.42*	.35*	.33*	1												
8. PM61	176	2.87	0.59	.08	.28*	.38*	.37*	.25*	.30*	.38*	1											
9. NM36	283	1.28	0.45	−.21*	−.26*	−.11	−.13	−.34*	−.16*	−.16*	−.22*	1										
10. NM42	243	1.19	0.30	−.22*	−.30*	−.24*	−.16*	−.28*	−.34*	−.17*	−.16*	.35*	1									
11. NM50	217	1.19	0.32	−.08	−.15*	−.34*	−.22*	−.23*	−.16*	−.34*	−.18*	.32*	.41*	1								
12. NM61	175	1.25	0.34	−.12	−.26*	−.26*	−.26*	−.18*	−.20*	−.25*	−.40*	.46*	.48*	.36*	1							
13. SRH36	310	4.02	0.83	.23*	.26*	.24*	.31*	.10	.07	.22*	.17*	−.15*	−.15*	−.14*	−.23*	1						
14. SRH42	279	3.81	0.80	.21*	.34*	.29*	.18*	.24*	.29*	.23*	.32*	−.06	−.24*	−.14*	−.34*	.37*	1					
15. SRH50	265	3.77	0.84	.15*	.29*	.37*	.28*	.18*	.11	.33*	.31*	−.19*	−.28*	−.13	−.23*	.40*	.50*	1				
16. SRH61	206	3.84	0.83	.05	.24*	.23*	.33*	.10	.14	.26*	.37*	−.13	−.23*	−.04	−.22*	.28*	.49*	.53*	1			
17. PS36	280	1.52	0.30	−.09	−.31*	−.22*	−.19*	−.15*	−.24*	−.12	−.26*	.28*	.29*	.22*	.38*	−.41*	−.43*	−.30*	−.32*	1		
18. PS42	256	1.55	0.35	−.19*	−.37*	−.30*	−.22*	−.15*	−.33*	−.25*	−.21*	.23*	.36*	.21*	.27*	−.48*	−.58*	−.40*	−.35*	.67*	1	
19. PS50	232	1.59	0.33	−.17*	−.26*	−.39*	−.40*	−.13	−.23*	−.35*	−.29*	.16*	.40*	.32*	.36*	−.40*	−.50*	−.58*	−.47*	.58*	.63*	1
20. PS61	206	1.57	0.32	−.11	−.31*	−.25*	−.39*	−.12	−.23*	−.32*	−.31*	.25*	.28*	.19*	.38*	−.33*	−.49*	−.41*	−.58*	.56*	.60*	.65*

LS, life satisfaction (range 1–4); PM, positive mood (range 1–4); NM, negative mood (range 1–4); SRH, self-rated health (range 1–5); PS, psychosomatic symptoms (range 1–4); 36, age 36; 42, age 42; 50, age 50; 61, age 61.

*$p < 0.05$.

Table 2. Standardised estimates from the RI-CLPMs linking emotional well-being (life satisfaction and positive and negative mood) and subjective health (self-rated health and psychosomatic symptoms).

	Life satisfaction				Positive mood				Negative mood			
Parameter	EST	*SE*	95% CI	*p*	EST	*SE*	95% CI	*p*	EST	*SE*	95% CI	*p*
Self-rated health (SRH)			$n = 333$[a]				$n = 334$[b]				$n = 334$[c]	
Correlations												
Between-person (r1)	.45	.14	[.18, .72]	.001	.57	.12	[.34, .81]	<.001	−.44	.11	[−.66, −.22]	<.001
Age 36 (r2)	.09	.11	[−.12, .30]	.382	−.11	.09	[−.29, .07]	.234	−.06	.09	[−.23, .11]	.474
Cross-lagged effects												
EWB36→SRH42 (a1)	.10	.13	[−.15, .35]	.420	.03	.13	[−.23, .28]	.847	.23	.10	[.03, .44]	.025
EWB42→SRH50 (a2)	.17	.12	[−.06, .41]	.144	−.13	.09	[−.30, .04]	.136	−.11	.11	[−.32, .10]	.309
EWB50→SRH61 (a3)	.09	.11	[−.13, .30]	.428	.06	.10	[−.15, .26]	.585	.24	.10	[.05, .44]	.014
SRH36→EWB42 (b1)	.08	.10	[−.11, .27]	.430	−.20	.11	[−.40, .01]	.058	−.06	.10	[−.26, .15]	.590
SRH42→EWB50 (b2)	.13	.12	[−.10, .36]	.260	−.06	.13	[−.30, .19]	.662	.23	.15	[−.07, .53]	.136
SRH50→EWB61 (b3)	.11	.09	[−.06, .29]	.194	.09	.12	[−.14, .32]	.444	.14	.12	[−.10, .38]	.262
Correlated change												
Age 42 (r3)	.26	.11	[.06, .47]	.013	.08	.13	[−.17, .32]	.540	.06	.15	[−.23, .35]	.670
Age 50 (r4)	.27	.09	[.09, .44]	.003	.18	.09	[.00, .35]	.054	.18	.13	[−.09, .44]	.185
Age 61 (r5)	.23	.07	[.09, .37]	.002	.20	.08	[.04, .36]	.014	.13	.13	[−.12, .39]	.306
Psychosomatic symptoms (PS)			$n = 335$[d]				$n = 320$[e]				$n = 320$[f]	
Correlations												
Between-person (r1)	−.34	.12	[−.57, −.12]	.003	−.35	.12	[−.59, −.11]	.004	.41	.12	[.17, .65]	.001
Age 36 (r2)	.09	.12	[−.16, .33]	.487	.00	.10	[−.20, .21]	.966	.16	.12	[−.08, .39]	.118
Cross-lagged effects												
EWB36→PS42 (a1)	−.15	.09	[−.34, .03]	.103	−.04	.09	[−.21, .13]	.629	.03	.10	[−.16, .21]	.778
EWB42→PS50 (a2)	−.10	.13	[−.34, .15]	.428	−.03	.10	[−.22, .16]	.753	.32	.13	[.06, .57]	.016
EWB50→PS61 (a3)	−.11	.14	[−.38, .17]	.448	−.27	.12	[−.50, −.04]	.023	−.17	.13	[−.43, .08]	.186
PS36→EWB42 (b1)	−.28	.10	[−.48, −.08]	.006	−.05	.11	[−.25, .16]	.661	.09	.14	[−.18, .36]	.508
PS42→EWB50 (b2)	−.20	.12	[−.43, .03]	.081	−.19	.12	[−.42, .04]	.111	.01	.14	[−.26, .29]	.926
PS50→EWB61 (b3)	−.32	.11	[−.54, −.10]	.004	−.13	.13	[−.38, .13]	.335	.17	.13	[−.08, .41]	.190
Correlated change												
Age 42 (r3)	−.25	.08	[−.40, −.10]	.001	−.27	.10	[−.46, −.08]	.005	.33	.11	[.10, .55]	.004
Age 50 (r4)	−.35	.11	[−.56, −.15]	.001	−.36	.10	[−.56, −.16]	<.001	.22	.13	[−.03, .48]	.089
Age 61 (r5)	−.35	.09	[−.51, −.18]	<.001	−.16	.10	[−.36, .04]	.119	.10	.12	[−.13, .34]	.392

EST, estimator (correlation or regression coefficient); *SE*, standard error; EWB, emotional well-being indicator (life satisfaction, positive mood and negative mood); SRH, self-rated health; PS, psychosomatic symptoms; 42, Age 42; 50, Age 50; 61, Age 61.

[a] χ^2 (21) = 40.07, p = .007; CFI = .96; RMSEA = .05.
[b] χ^2 (21) = 28.67, p = .122; CFI = .98; RMSEA = .03.
[c] χ^2 (21) = 33.43, p = .042; CFI = .96; RMSEA = .04.
[d] χ^2 (21) = 29.97, p = .093; CFI = .99; RMSEA = .04.
[e] χ^2 (21) = 20.99, p = .460; CFI = 1.00; RMSEA = .00.
[f] χ^2 (21) = 30.76, p = .078; CFI = .98; RMSEA = .04.

of life satisfaction at ages 42 (p = .006) and 61 (p = .004), respectively. That is, fewer-than-expected symptoms predicted higher-than-expected life satisfaction six to 11 years later. In addition, earlier positive and negative mood predicted later subjective health. Lower-than-expected negative mood at 42 and higher-than-expected positive mood at age 50 were associated with fewer-than-expected psychosomatic symptoms at ages 50 (p = .016) and 61 (p = .023), respectively. However, opposite associations were also observed. A higher-than-expected negative mood at ages 36 and 50 predicted better-than-expected self-rated health at ages 42 (p =.025) and 61 (p = .014), respectively.

The RI-CLPM also allowed the investigation of the correlated change (i.e. correlated residuals) between emotional well-being and subjective health. The results suggested that within-person change in life satisfaction across the measurement waves was associated with a within-person change in self-rated health (age 61: p = .002—age 42: p = .013) and psychosomatic symptoms (age 61: p < .001—age 42 and 50: p = 0.001). Similar associations were found between positive mood and self-rated health (age 61: p = .014), positive mood and psychosomatic health (age 42: p < .001—age 50: p = .005), and negative mood and psychosomatic symptoms (age 42: p = .004).

Discussion

This study examined the reciprocal and longitudinal associations between multiple emotional well-being and subjective health indicators from middle adulthood to the beginning of late adulthood using a longitudinal study of Finnish adults. First, we observed a reciprocal within-person link between emotional well-being and subjective health as both emotional well-being and subjective health indicators were found to predict each other 6–11 years later, although the associations depended on the variables and age periods in question. Fewer psychosomatic symptoms at ages 36 and 50 predicted higher life satisfaction at ages 42 and 61, respectively. Lower negative mood at age 42 and higher positive mood at age 50 predicted fewer psychosomatic symptoms at ages 50 and 61, respectively. Higher levels of negative mood at ages 36 and 50 were associated with better self-rated health at ages 42 and 61, respectively. Second, the dynamic relationship between subjective health and emotional well-being was further supported by the findings related to correlated change. Third, in addition to the longitudinal within-person associations, there was a time-invariant, trait-like between-person association between all the emotional well-being and subjective health variables.

Previous longitudinal studies have shown that emotional well-being predicts subjective health (Kesavayuth et al., 2022; Wiese et al., 2019; Willroth et al., 2020) and vice versa (Gana et al., 2013, 2015; Mroczek & Spiro, 2005; Wiese et al., 2019). Similarly, we observed both directions. More specifically, we found different associations between subjective health and the cognitive (i.e. life satisfaction) and affective domains (i.e. positive and negative mood) of emotional well-being. A higher number of symptoms predicted lower life satisfaction at the within-person level, which is in line with the view that different life situations may influence how individuals perceive their lives

(Diener, 1984; Diener et al., 1999). It has been argued that when health problems complicate an individual's daily living and ability to interact with others, their emotional well-being can be impacted (Diener et al., 2017). Similarly, the life satisfaction measure used in this study included different aspects of life, such as relationships, leisure time and work. This further supports the view that perceiving symptoms may contribute to how individuals assess different areas of life, and consequently, health problems may be reflected in their overall life satisfaction.

In line with the literature on the link between the affective domain of emotional well-being and health (DeSteno et al., 2013; Pressman & Cohen, 2005), a higher positive mood and a lower negative mood predicted fewer psychosomatic symptoms measured eight to 11 years later at the individual level. As mentioned above, the mechanisms between this beneficial path may lie in direct or indirect processes, such as better immune functioning (Cohen et al., 1993), stress buffering (Pressman & Cohen, 2005) or engaging in health-enhancing behaviour (Kesavayuth et al., 2022). The existence of significant associations is interesting as we used the measure of positive and negative mood (Brief Mood Introspection Scale, Feldman, 1995; Mayer & Gaschke, 1988), which measures current emotions rather than a general tendency to experience negative or positive emotions (i.e. positive and negative affectivity), and associations were found even six to 11 years later. However, moods are believed to reflect the trait affect (Cross & Pressman, 2017), which supports the observed results.

Not all the observed associations were in line with the hypotheses. The higher negative mood at ages 36 and 50 predicted better self-rated health at ages 42 and 61, respectively. These results suggest that negative mood could perhaps be beneficial in some circumstances. Since the personality trait of neuroticism reflects a tendency to experience negative emotions (McCrae & Costa, 2003, pp. 47–48), one possible explanation may lie in the concept of *healthy neuroticism*. Friedman (2000, 2019) presented this concept to explain the circumstances in which vigilance and worrying may be beneficial for health. For example, if a person is perceiving changes in health or facing social losses, appropriate worrying may lead them to seek help for symptoms or engage in healthy behaviours, such as adherence to medical care, or avoiding unhealthy ones, such as harmful substance use (Friedman, 2019). However, this does not mean that increasing negative mood is a useful way to improve individual health; rather, it suggests that negative mood could be beneficial in some circumstances and that the links between moods and subjective health are complex.

In relation to personality characteristics, individuals may also regulate negative emotions differently through strategies that may contribute to different health statuses. For example, some individuals may feel it important to *maintain* their moods, whether they are positive or negative, while others may try to *repair* their moods (Mayer & Stevens, 1994). Both of these emotion regulation strategies have been linked to better health (i.e. repair was associated with better metabolic health and maintenance with better subjective health) in a previous JYLS-based study, while emotional dysregulation (i.e. emotional ambivalence) was associated with lower subjective health (Kinnunen et al., 2005). It may be that negative mood is not bad in itself and that how individuals succeed in regulating these moods matters in terms of their perception of their health.

Nevertheless, higher negative mood at age 42 predicted increased psychosomatic symptoms at age 50, and at the between-person level, those who reported higher negative mood generally reported lower subjective health, as hypothesised. These results indicate that the associations between negative mood and subjective health are dynamic at the within-person level and that the between-person level results may not be directly computed to the individual level. Although some of the results contradicted the hypotheses, it is not unusual for within-person associations to differ or even contradict between-person associations. Furthermore, Hudson et al. (2019) observed a few associations with opposite directions (e.g. more frequent doctor visits predicted lower negative affect). It is also important to acknowledge that the present study had a time interval of 6–11 years between assessments, during which various life events and changes may have contributed to emotional well-being and health, including their fluctuations.

Although the observed cross-lagged associations were not unambiguous, the results support the view that emotional well-being and subjective health are dynamically linked in within-person level. For example, although self-rated health did not predict later life satisfaction (which psychosomatic symptoms did), the within-person changes in self-rated health and life satisfaction were correlated. These findings are similar to those observed by Hudson et al. (2019), who argued that although cross-lagged associations were not found, the observed correlated change suggested that common causes contribute to emotional well-being and health and/or that they influence each other. In addition to the within-person associations, there were stable, trait-like differences between individuals in emotional well-being and subjective health. Although these between-person associations have not been reported in previous studies using the RI-CLPM (Hudson et al., 2019; Wiese et al., 2019), the results indicating that those with higher emotional well-being tended to have better subjective health were as expected. This suggests that those low in emotional well-being may be at risk of low subjective health and vice versa. For example, if the aim is to identify those whose subjective health should be improved, this could potentially be done by identifying those with low emotional well-being and vice versa.

There are some limitations to be considered. First, we utilised self-reported questionnaires in measuring both emotional well-being and subjective health, which may be problematic in terms of social desirability and positivity or response biases (Diener et al., 2017). Although the use of subjective health variables could be seen as a limitation compared to the use of objective health variables, there is no direct measure of 'true health' (Jylhä, 2009). Of the subjective health measures, self-rated health has been shown to predict mortality even when controlled for several other health-related indicators (Benyamini & Idler, 1999; DeSalvo et al., 2006; Idler & Benyamini, 1997). Self-rated health has been found to have a solid biological basis (Kananen et al., 2021), and it may measure something that medical tests and histories may not be able to capture, such as minor but undiagnosed diseases (Cross & Pressman, 2017). Second, the life satisfaction scale had relatively low Cronbach alphas (.55–.68), but it correlated with the subjective health variables to the same extent as the other emotional well-being indicators (Table 1). Also, when measuring negative aspects of emotional well-being, floor effects may be a possibility. However, we do not consider this merely as a limitation of the measure but, rather, a reflection of the

nature of the measured phenomenon (i.e. negative mood). Third, although the analyses (i.e. RI-CLPM) used in this study may be more appropriate for investigating causal relationships, this study was based on correlational data, so no strong causal statements could be made (Hamaker et al., 2015). Fourth, this study was based on a relatively small sample of Finnish men and women born in 1959. The sample size may have had limited sensitivity to detect small effects, so the results may not be generalisable to other age cohorts and cultures.

This study also has various strengths. We used unique data drawn from the JYLS, where the same participants have been followed for over 50 years. Despite the long follow-up, the representativeness of the JYLS sample compared to the Finnish age cohort born in 1959 has remained high over the years (Kokko et al., 2023; Pulkkinen, 2017). By including four measurement waves (ages 36, 42, 50 and 61), we were able the investigate the longitudinal associations between emotional well-being and subjective health from middle adulthood to the beginning of late adulthood. The analysis method (RI-CLPM, Hamaker et al., 2015) used in this study is well suited for investigating reciprocal associations between study variables while differentiating the within-person changes from stable, between-person differences. In addition, we included multiple indicators of emotional well-being that reflect both the cognitive (i.e. life satisfaction covering multiple domains of life) and affective (i.e. positive and negative mood) domains and investigated subjective health from two perspectives by analysing both self-rated health and psychosomatic symptoms.

To conclude, although we were not able to suggest whether emotional well-being or subjective health was the driving force in their association, we can conclude that these constructs are linked longitudinally. The study supports previous findings (Hudson et al., 2019; Wiese et al., 2019) about the dynamic and reciprocal relationship between emotional well-being and subjective health by showing that both emotional well-being and subjective health may predict each other 6–11 years later and that these variables may change together. However, the magnitude and direction of the associations between emotional well-being and subjective health may depend on the variables and age period being studied, which further reflects the complexity of the association between emotional well-being and subjective health.

Acknowledgments

The authors are grateful to the participants of the JYLS and Professor Lea Pulkkinen, who initiated the JYLS in 1968 and directed it until 2012. This study was presented in August 2023 at the European Conference on Developmental Psychology in Turku, Finland.

Disclosure statement

The authors declare no competing interests.

Funding

This work was supported by the Academy of Finland under a grant awarded to K. Kokko (no. 323541), which covered the most recent data collection phase (2020–2021). The Academy of

Finland also supported the previous data collection phases (e.g. nos. 31121, 40166, 44858, 127125 and 118316).

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Data availability statement

The data from previous data collection phases in 1995, 2001 and 2009 are stored in the Finnish Social Science Data Archive (https://www.fsd.uta.fi/en/), where the data from the most recent data collection phase in 2020–2021 will also be stored. The data cannot be publicly available due to their sensitivity. The pseudonymised datasets will be made available to external collaborators once the conditions for using the data and publishing the results have been agreed upon. Data can be requested by contacting the principal investigator Dr. Katja Kokko (katja.r.kokko@jyu.fi).

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