# Life skills, wealth, health, and wellbeing in later life

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**Life skills play a key role in promoting educational and occupational success in early life, but their relevance at older ages is uncertain. Here we measured five life skills—conscientiousness, emotional stability, determination, control, and optimism—in 8,119 men and women aged 52 and older (mean 66.7 y). We show that the number of skills is associated with wealth, income, subjective wellbeing, less depression, low social isolation and loneliness, more close relationships, better self-rated health, fewer chronic diseases and impaired activities of daily living, faster walking speed, and favorable objective biomarkers (concentration of high-density lipoprotein cholesterol, vitamin D and C-reactive protein, and less central obesity). Life skills also predicted sustained psychological wellbeing, less loneliness, and a lower incidence of new chronic disease and physical impairment over a 4-y period. These analyses took account of age, sex, parental socioeconomic background, education, and cognitive function. No single life skill was responsible for the associations we observed, nor were they driven by factors such as socioeconomic status or health. Despite the vicissitudes of later life, life skills impact a range of outcomes, and the maintenance of these attributes may benefit the older population.**

life skills | aging | resources | personality | health

Life skills refer to a set of personal characteristics and capabilities that are thought to increase chances of success and wellbeing in life. They include persistence and determination ("grit"), conscientiousness, self-control, social skills, self-confidence, optimism, and emotional stability (1–3). They are often described as "noncognitive" to distinguish them from cognitive abilities and intellectual capacity. The term "skill" is used instead of trait in part to highlight the notion that these characteristics are malleable rather than fixed characteristics, although many life skills are partly heritable (4, 5). Various life skills have individually been found in childhood and adolescence to predict greater academic success, future employment, prosocial behavior, and health (2, 6, 7). Fostering of life skills in early life is of major interest to policy-makers in education, crime prevention, public order, employment, and health (8).

Studies of middle-aged and older people have documented associations between individual characteristics such as conscientiousness, optimism, and emotional stability and a range of social and health outcomes (9–14). However, there have been few investigations of combinations of attributes (15, 16), and little is known about the importance of the accumulation of life skills for economic, social, health, and biological outcomes in later life. We therefore investigated whether the number of skills manifest at older ages is related to a broad range of outcomes after taking childhood circumstances, education, and cognitive ability into account.

## Results

We assessed five core life skills in 2010 in a sample of 8,119 men and women aged 52 to over 90 y old (mean 66.7 y) from the English Longitudinal Study of Aging (17), a nationally representative population cohort. The five skills were conscientiousness, emotional stability, determination, optimism, and sense of control, and an index of the number of life skills was derived based on the highest response category for each facet (Table 1). With this classification, 29.4% of respondents had low life skills (not scoring high on any characteristic), 30.8% had one, 20.6% two, 11.9% three, and 7.4% four or five skills. Binary logistic regression and ordinary least squares (OLS) regression were used to investigate the relationship between the number of life skills and economic, psychosocial, health, physical capability, and biological outcomes. All analyses took into account age, gender, family socioeconomic background, educational attainment, and current cognitive function, so as to establish that associations between life skills and outcomes were not due to early socioeconomic endowments or cognitive ability. We observed moderate associations between the number of life skills and all covariates except gender (*SI Appendix*, Table S1); when we regressed each life skill on the covariates, $r^2$ ranged from 0.009 to 0.056, with an $r^2$ of 0.025 for the accumulated measure of life skills. The intercorrelations between the five skills were also low to moderate, as shown in *SI Appendix*, Table S2, where mean scores for each skill at every level of the cumulative index are also detailed.

The associations of life skills with economic and psychosocial factors are summarized in Fig. 1 (*SI Appendix*, Table S3). The proportion of participants in the highest quintile of wealth was positively associated with the number of life skills, ranging from 18.7% for the low to 26.4% in the four- or five-skill category. The odds ratio (OR) adjusted for covariates rose from 1.22 (95% confidence intervals, CI, 1.04–1.43, $P = 0.015$) for participants with one skill to 1.62 (95% CI 1.29–2.04) for those with four or five skills, in comparison with those having low life skills. We found a similar gradient across life skill categories for net family income, with significantly increased odds of being in the top income quintile for those with two (OR = 1.23), three (OR = 1.27), and four or five (OR 1.48) skills. Parental occupation, educational attainment, and cognitive scores were also independently associated with wealth and income in these analyses (*SI Appendix*, Table S3).

### Significance

**Life skills such as persistence, conscientiousness, and control are important in early life. Our findings suggest that they are relevant in later life as well. Higher scores on five life skills (conscientiousness, emotional stability, determination, control, and optimism) were associated both cross-sectionally and longitudinally with economic success, social and subjective wellbeing, and better health in older adults. No single attribute was especially important; rather, effects depended on the accumulation of life skills. Our results suggest that fostering and maintaining these skills in adult life may be relevant to health and wellbeing at older ages.**

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**Table 1. Definitions of life skills**

| Factor | Measure | Proportion of respondents defined as possessing the skill, % |
|---|---|---|
| Conscientiousness | Highest quartile (allowing for ties) on the four-item conscientiousness scale | 23.3 |
| Emotional stability | Lowest quartile (allowing for ties) on the six-item neuroticism scale | 29.5 |
| Persistence | Maximum ratings to the question about feeling determined | 20.5 |
| Optimism | Maximum scores on two optimism items: "I feel that life is full of opportunities" and "I feel that the future looks good for me." | 24.7 |
| Control | Maximum scores on the statement about having control in most situations | 40.7 |

Subjective wellbeing was assessed in terms of enjoyment of life by using a measure previously shown to predict reduced mortality and functional impairment (18, 19). Mean scores adjusted for covariates were higher among respondents with more life skills, with a significant gradient across skills categories ($P < 0.001$, Fig. 1). Conversely, the proportion of participants reporting significant depressive symptoms declined from 22.8% among those with low life skills to 3.1% in those with four or five skills. This difference corresponded to a substantial 93% reduction in multivariate adjusted odds of depressive symptoms in the four or five compared with the low category (*SI Appendix*, Table S3).

Life skills were associated with a range of social outcomes, with less social isolation, more close relationships, lower loneliness, and more volunteering among participants with a larger number of skills (Fig. 1 and *SI Appendix*, Table S4). In all cases, we observed a linear gradient across skill categories ($P < 0.001$). For example, the proportion of respondents in the highest loneliness tertile was 49.6% of those with low skills, declining to 10.5% in those with four or five skills. Regular volunteering rose from 28.7 to 40.0% with increasing numbers of life skills.

The relevance of life skills is evident in the health domain as well (Fig. 2 and *SI Appendix*, Table S5). Self-rated health is a widely used indicator of general health that predicts future mortality (20). The proportion of respondents who rated their own health as fair or poor (compared with excellent, very good, or good) was 36.7% among those with low life skills, falling to 6% in participants with four or five skills. The presence of one of more serious chronic diseases (e.g., coronary heart disease, cancer, diabetes; see *SI Appendix* for more details) also showed a linear gradient with increasing life skills, so the adjusted odds of chronic disease were 0.53 (95% CI 0.44–0.65) in those with the most life skills. Life skills were inversely associated with the prevalence of impaired activities of daily living (ADL). By contrast, gait or walking speed, an objective measure that predicts future mortality in older population samples (21), was significantly faster among individuals with more skills.

Objective biomarkers including blood analytes were recorded in the majority of respondents during a home visit by a study nurse in 2012. Four indicators are shown in Fig. 2, and all demonstrate favorable associations with life skills (*SI Appendix*, Table S6). Thus, the proportion of respondents with low levels of high-density lipoprotein (HDL) "good" cholesterol decreased from 12.7 to 8.8% across life skill categories. Number of life skills was positively associated with vitamin D concentration, whereas levels of the inflammatory marker C-reactive protein were lower among participants with more skills. Central obesity, an indicator of fat distribution that is particularly relevant to metabolic and cardiovascular diseases, was greatest in people with few life skills. Compared with individuals with low skills according to our categorization, the odds for central obesity adjusted for covariates were 0.71 (95% CI 0.59–0.84) in those with three and 0.78 (95% CI 0.64–0.97) in respondents with four or five skills.

Firm conclusions about the temporal sequence of associations between life skills cannot be drawn from these cross-sectional analyses. We therefore carried out longitudinal analyses over a 4-y period (2010–2014) to discover whether life skills at baseline predicted changes over time in economic, wellbeing, social, and health outcomes (*SI Appendix*, Tables S7 and S8). These analyses were weighted to take account of nonresponse in 2014. Number of life skills did not predict changes in wealth or income over this period. However, a greater number of life skills predicted higher enjoyment of life and less depression at 4-y follow-up even after controlling statistically for baseline enjoyment and depression, respectively (Fig. 3). In the social domain, life skills predicted the number of close relationships and loneliness ratings in 2014, controlling for 2010 levels.

Life skills at baseline were inversely associated with fair or poor self-rated health on follow-up, controlling statistically for baseline self-rated health (*SI Appendix*, Table S8). Life skills also predicted the onset of serious illness over the 4-y period; 51.7% of participants with low life skills developed one or more chronic disease, falling to 40.4% of the four- or five-skill group, with a significant gradient across intermediate categories (Fig. 3). Arthritis was the most common new disease in this older population; however, the gradient was preserved when arthritis was excluded from the analysis. Number of life skills predicted the emergence of impaired ADLs over the 4-y period in participants who had no problems with ADLs at baseline; 16% of individuals in the low skill category developed incident ADL impairment compared with 9.2% in the 4 or 5 category. Finally, we also analyzed gait speed in 2014 in respondents aged 60 and older. Gait speed fell markedly on average in this population, but remained significantly faster in those with more life skills, even after baseline differences had been taken into account. It should be noted that in all of the analyses detailed in *SI Appendix*, Tables S3–S8, the unadjusted associations between life skills and outcomes were greater than in the fully adjusted models.

These findings are based on the accumulation of five life skills, but it is plausible that one particular attribute dominates the associations with other outcomes. We therefore conducted a series of analyses in which we successively removed one of the attributes from the life skill index. The results (*SI Appendix*, Table S9) indicate that the significant linear gradients across outcomes with the various reduced life skill indices remained strong. There is little evidence that any one of the five skills is substantially more important than the others.

We considered three further alternative explanations of results. The first is that these associations between life skills and outcomes are driven by variations in socioeconomic resources. Because we found that a greater number of life skills is correlated with greater wealth, it is plausible that wealth is responsible for the other associations. Consequently, we repeated all analyses adjusting statistically for wealth at baseline. The findings (*SI Appendix*, Table S10) show little evidence for such an effect, in that both cross-sectional and longitudinal gradients across life skill categories were maintained when wealth was taken into account. A second possibility is that health is the key determinant of these findings, with the better health of those with more life skills accounting for other associations. When we repeated the analyses adjusting statistically for self-rated health, some of the associations between life skills and health-related outcomes were reduced, presumably because these measures are

directly correlated, but gradients across most outcomes remained robust (*SI Appendix*, Table S10). Finally, instead of defining the presence of life skills by categorizing each component, we computed average normalized scores across the entire distribution of each life skill. When we analyzed aggregate life skills as a continuous variable, the pattern of results was the same as that found in the main analyses, as shown in *SI Appendix*, Table S10.

## Discussion

It is well recognized that some highly intelligent people or those who come from privileged backgrounds may not succeed because they lack character strengths, whereas less well-endowed individuals who are reliable and self-disciplined do attain their goals (22). So-called noncognitive life skills are crucial in early life, but our findings indicate that they continue to be relevant at older ages. Although causal conclusions cannot be drawn from observational results, we took cognitive function, education, and family background into account, ruling them out as being responsible for associations with life skills. Furthermore, our finding that the number of life skills is related to favorable patterns across a variety of domains including economic success, mental wellbeing, social function, health, physical capacity, and biomarkers argues against confounding by unmeasured factors. The longitudinal analyses add further support to the relevance of life skills, although we cannot control for any trends that took place before the baseline.

The concept of life skill embraces several aspects of personal capability, and not all were assessed here. We did not have measures of social skills, empathy, or self-efficacy that are commonly regarded as relevant skills (1, 7, 22). The study builds not only on the childhood life skill literature, but on evidence from psychology

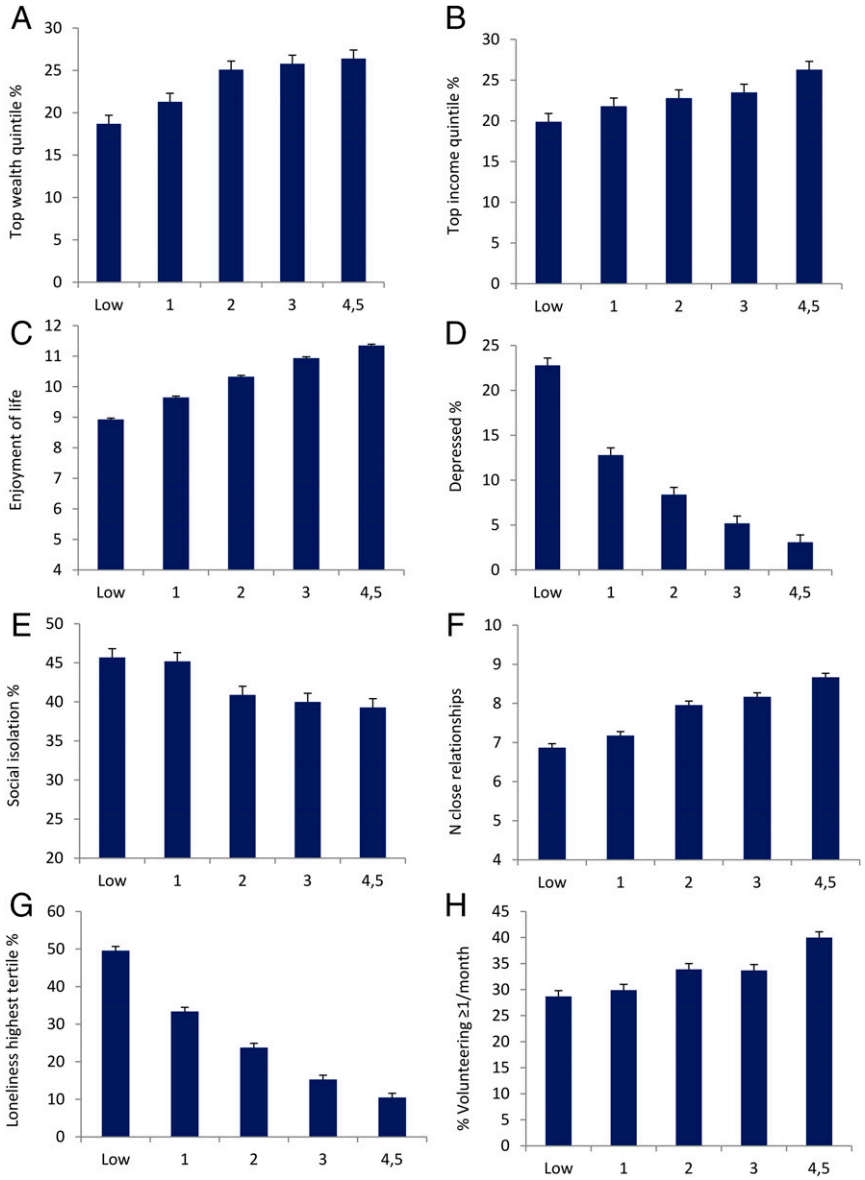


**Fig. 1.** Cross-sectional associations between life skills and economic, psychological, and social outcomes. The horizontal axis in each graph represents the number of life skills ranging from low to 4 or 5 (4,5). (*A*) Proportion of respondents in the top quintile for total nonpension wealth. (*B*) Proportion of respondents in the top quintile for total weekly net income. (*C*) Mean enjoyment of life ratings. (*D*) Proportion of individuals with depressive symptom scores ≥4. (*E*) Proportion of respondents with social isolation scores ≥1. (*F*) Mean number of close relationships. (*G*) Proportion of respondents with loneliness scores in the highest tertile. (*H*) Proportion of respondents who volunteered at least once per month. All analyses were adjusted for age, gender, parental occupation, educational attainment, and cognitive function. Error bars are SEM.

on traits and capabilities that are related to many different adult outcomes including health, marital stability, labor market outcomes, credit ratings, and health-related biology (11, 23–25). Combined associations between optimism, self-esteem, and social support and self-rated and objective health indicators have been reported (16, 26), whereas optimism, personal control, and self-esteem have been associated with reduced systemic inflammation in lower socioeconomic status men but not women (15). Research among older men and women on combinations of the skills measured here is limited at present. Many other factors are of course relevant to later life experience, including early life adversity, external circumstances in adult life, healthy lifestyles, genetic risk, and uncontrollable losses and events. Cognitive capabilities are also crucial for health and wellbeing (27), and for success in many domains of life (28), and interactions between life skills and cognition may be important. This investigation was focused on documenting associations between life skills and outcomes, and the processes underlying these relationships require further study. Apart from the biomarkers, other variables were based on self-report, so they may be susceptible to reporting bias. Nevertheless, this work opens up possibilities for exploring ways in which a range of life skills might be enhanced in people at older ages, for the possible improvement of health, wellbeing, and social function in the later stages of life.

## Materials and Methods

Data were analyzed from the English Longitudinal Study of Aging (ELSA), a longitudinal panel study of men and women aged 50 and older living in England that started in 2002 (17). Fuller details are provided in *SI Appendix, SI Materials and Methods*. The questionnaires and general methods of data collection are detailed at www.elsa-project.ac.uk. The primary data for these analyses were collected on wave 5 of ELSA in 2010, because that was the occasion on which the measures of life skills were administered. Biomarkers were assessed in wave 6 (2012), whereas longitudinal analyses of changes in psychosocial and health outcomes over a 4-y period involved comparison of wave 5 (2010) with data collected in wave 7 (2014). ELSA was approved by London Multicentre Research Ethics Committee (MREC/01/2/91), and informed consent was obtained from all participants.

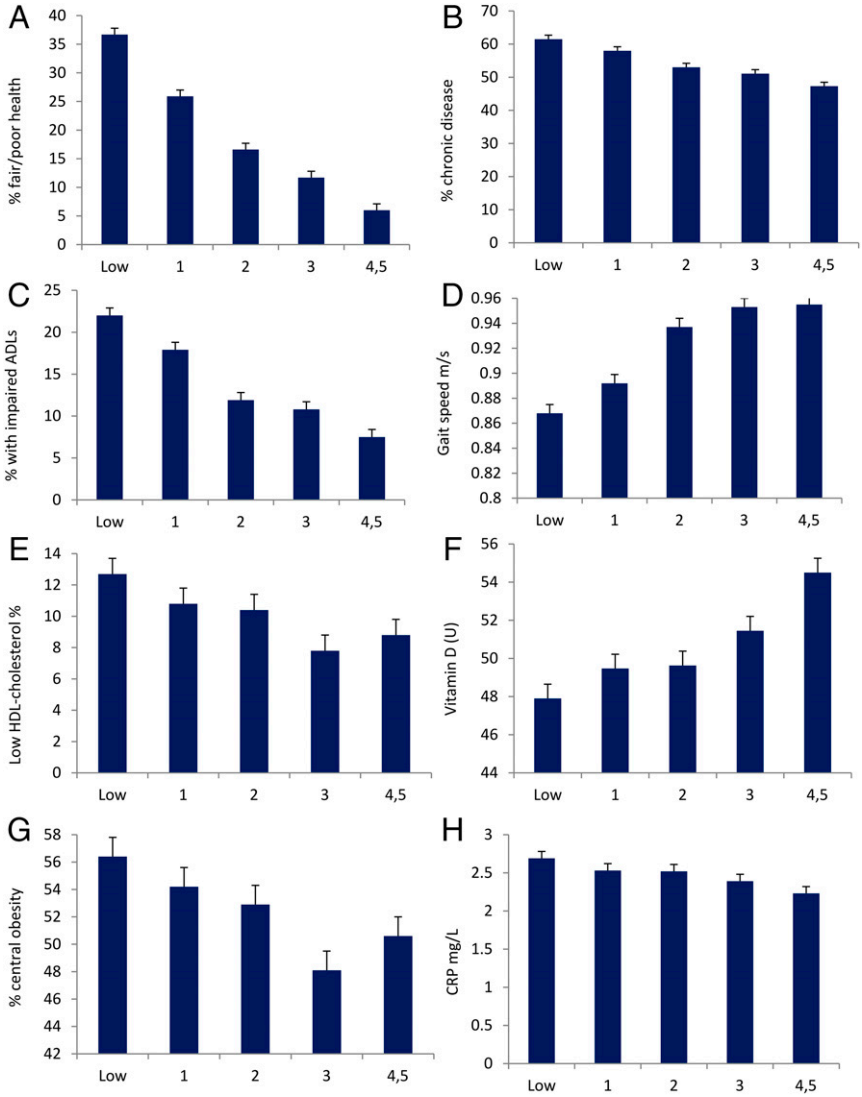


**Fig. 2.** Cross-sectional associations between life skills and health and biological outcomes. The horizontal axis in each graph represents the number of life skills ranging from low to 4 or 5. (*A*) Proportion of respondents who stated that they were in fair or poor health. (*B*) Proportion of respondents with one or more serious chronic diseases. (*C*) Proportion of respondents with impaired activities of daily living. (*D*) Mean gait speed on a standardized walking test. (*E*) Proportion of respondents reporting fair or poor health adjusted with HDL cholesterol levels below the critical threshold. (*F*) Mean plasma vitamin D concentration. (*G*) Proportion of respondents with central (abdominal) obesity. (*H*) Mean plasma C-reactive protein concentration. All values were adjusted for age, gender, parental occupation, educational attainment, and cognitive function. Error bars are SEM.

**Measurement of Life Skills.** Conscientiousness and emotional stability were assessed by using the Midlife Development Inventory Personality Scales (29). Persistence or determination was assessed with a single item, participants being asked the extent to which they had felt "determined" over the past 30 d (responses ranged from "not at all" to "very much"). Optimism was measured with two items; participants were asked to rate their agreement with the statements "I feel that life is full of opportunities" and "I feel that the future looks good for me." Sense of control was indexed by the single item "At home, I feel I have control over what happens in most situations." The life skills index was created by summing the number of characteristics on which participants were in the highest category as detailed in Table 1.

**Covariates.** Childhood socioeconomic status was assessed in terms of the occupation of the participant's father or main carer when they were 14 y old. Educational attainment was measured as the individual's highest educational qualification and divided into five categories. Cognitive capacity at baseline was measured by aggregating performance on five objective tests administered by face-to-face interviewers. These tests were immediate recall, delayed recall, verbal fluency, and speed and accuracy on a letter cancellation task (30). We *z* transformed scores on the five tests and averaged these to generate an index of cognitive function. Marital status was not included as a covariate, because preliminary analyses indicated that it did not modify associations between noncognitive life skills and social, economic, or other outcomes.

**Economic and Psychosocial Outcomes.** Wealth was derived from a detailed assessment of the participant's economic resources, and included financial, housing, and physical wealth but excluded pension wealth. Income was computed as total weekly net family income from all sources including employment, state benefits, pensions, and other assets. Positive subjective wellbeing was assessed with four items from the CASP19 as detailed (19). Depressive symptoms were measured by using the eight-item Centre for Epidemiologic Studies Depression Scale, with a score of ≥4 being used to indicate significant symptomatology. Social isolation was assessed by using

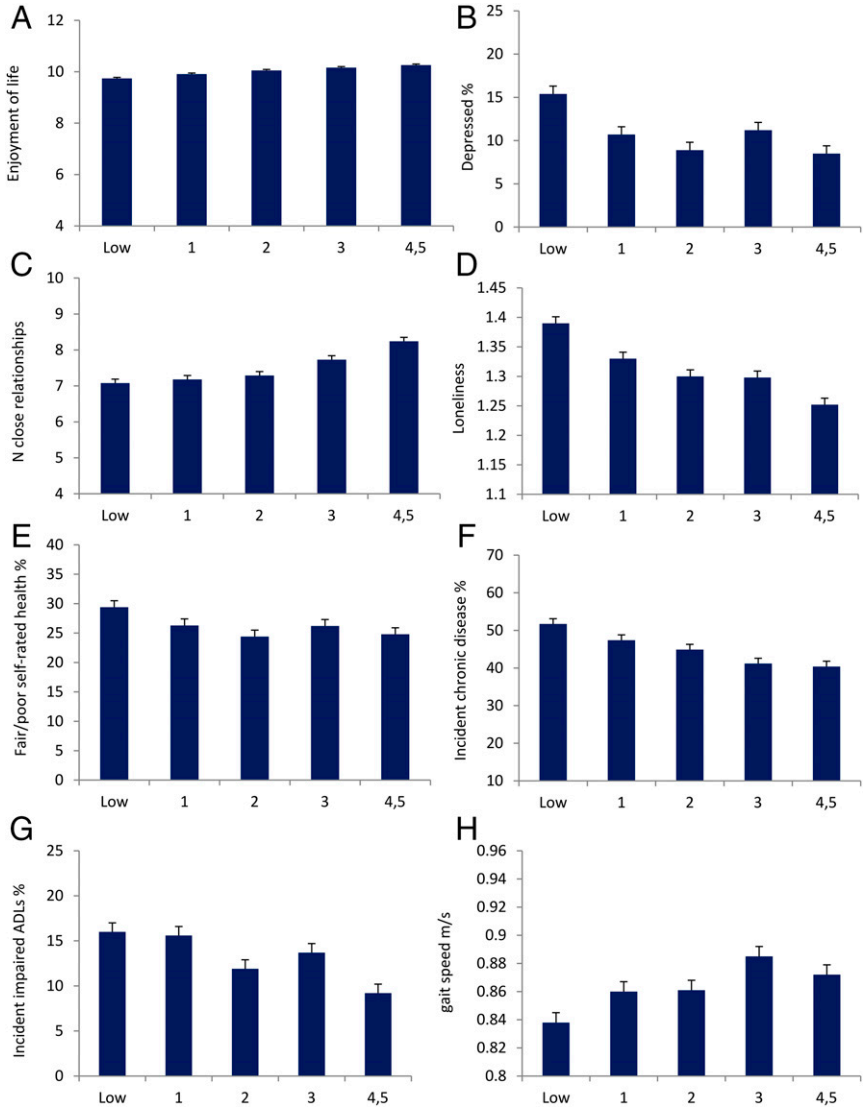


**Fig. 3.** Longitudinal associations between life skills and psychological, social, health, and functional outcomes. The horizontal axis in each graph represents the number of life skills ranging from low to 4 or 5 recorded at baseline (2010). (*A*) Mean enjoyment of life scores in 2014 adjusted for enjoyment of life in 2010. (*B*) Proportion of individuals with depressive symptom scores ≥4 in 2014 adjusted for 2010 scores. (*C*) Mean number of close relationships in 2014 adjusted for close relationships in 2010. (*D*) Mean loneliness in 2014 adjusted for loneliness in 2010. (*E*) Proportion of respondents reporting fair or poor health adjusted for self-rated health in 2010. (*F*) Proportion of respondents with one or more incident serious chronic diseases between 2010 and 2014. (*G*) Proportion of respondents with incident impaired activities of daily living between 2010 and 2014. (*H*) Mean gait speed on the standardized walking test in 2014 adjusted for gait speed in 2010. All values were additionally adjusted for age, gender, parental occupation, educational attainment, and cognitive function. Error bars are SEM.

an index related to extent of contact with children, other family members, and friends, and participation in organizations and clubs. Number of close relationships was determined by self-report, and loneliness by using the three-item short form of the Revised UCLA loneliness scale (31). Volunteering was assessed as a measure of prosocial behavior. Participants were asked whether they carried out any volunteer work, and those who volunteered at least once per month were classified as volunteers.

**Health, Disability, and Biomarkers.** Self-rated health was assessed on a five-point rating, and we analyzed the proportion of individuals giving fair/poor ratings. Information about six doctor-diagnosed chronic diseases (coronary heart disease, stroke, cancer, diabetes, chronic lung disease, and arthritis) was collected. Participants were questioned about the presence of impairments in six ADLs (e.g., difficulty in bathing or showering) that lasted at least 6 mo. Gait speed was assessed with two eight-foot walking tests from a standing start by respondents aged ≥60 y. The health-related biomarkers were obtained during a separate home visit by a study nurse. Central obesity was measured as waist circumference, with gender-specific cut-points used to define central obesity. Blood samples were analyzed for HDL cholesterol, vitamin D (plasma 25-hydroxyvitamin D), and high-sensitivity plasma C-reactive protein.

**Statistical Analysis.** The proportion of respondents who possessed all five life skills was small (137 or 1.7%), so we combined the groups with four or five skills in a single category, making five categories in all. We used OLS regression to analyze associations between life skills and continuously distributed outcomes, whereas binary logistic regression was used to analyze the categorical outcomes, with the low skill group as the reference category. All models included age, sex, parental occupation, educational attainment, and cognition. *SI Appendix*, Tables S3–S8 detail unadjusted and fully adjusted associations between life skills and outcomes. Like all panel studies of the general population, ELSA shows attrition across waves of data collection, with older, less affluent, and less educated participants being more likely to drop out (17). We therefore used weights in the longitudinal analyses to correct for sampling probabilities and for differential nonresponse and to calibrate back to the 2011 National Census population distributions for age and sex.

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