

# Part III

## Resilience

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# Chapter 6

## Resilience of older adults to a life of low socioeconomic position: Results from the Longitudinal Aging Study Amsterdam

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## Abstract

Although on average, groups with a low socioeconomic position (SEP) demonstrate less favourable physical, mental and social functioning in old age, there may be subgroups that have aged successfully despite exposure to a lifetime of low SEP. The literature on resilience suggests that these subgroups may have had access to resources that helped them avoid some of the negative consequences of socioeconomic adversity. This study aimed to identify such resources. Data from 2,185 participants in the Longitudinal Aging Study Amsterdam (the Netherlands) aged 55 and over were used. We identified a resilient group based on low scores on three indicators of SEP and high scores on a previously constructed, multidimensional and longitudinal index of Successful Aging (SA). We examined which lifestyle, psychological and social characteristics distinguished this resilient group from groups with other combinations of SEP and SA. Results showed that compared to older adults with low SEP and low SA scores, the resilient had a lower number of chronic diseases, lower rate of smoking, higher emotional support, higher mastery, lower social inadequacy and a higher propensity to pray. Almost all characteristics of the resilient group were comparable to those of older adults with a high SEP and high SA scores. In terms of physical activity and partner status, they were even more favourable. Resilience in the face of socioeconomic adversity thus involved avoiding some of the root causes of a loss of biological integrity while optimizing the availability of social support, coinciding with a strong sense of control.

## Introduction

It has been well-established that groups that have been exposed to a low socioeconomic position (SEP) have a high burden of health problems and relatively short life expectancies. There is evidence that socioeconomic inequalities in health and mortality persist into old age, as do inequalities in functional problems (1–6). This marks a low SEP as one of the fundamental causes of health problems and reduced wellbeing, and groups with a low SEP as in need of public health attention.

The need for preventive measures to reduce socioeconomic inequalities in health should never be disputed, but it is oftentimes far from clear what interventions should focus on. Research shows that what proves to be protective among groups with a high SEP may not be the same as what is protective in groups with a low SEP, and vice versa (7). Examining characteristics of groups of individuals with a low SEP who nevertheless demonstrate favourable trajectories of health and functioning may provide new clues. There is substantial heterogeneity in health and functioning in old age and there may be subgroups within those with a low SEP that have aged successfully. An important question is if these subgroups have had access to specific resources or have had the benefit of specific assets that helped them avoid some of the negative consequences of socioeconomic adversity. Identifying these may be informative for future prevention efforts.

Resilience research delves into such questions. It is concerned with identifying subgroups that have shown favourable outcomes despite exposure to specific risk experiences (8–10). A premise of resilience research is that it helps to answer questions about why and how health problems occur and why and how groups may remain free from health problems despite adversity. Characteristics of resilient groups are viewed as holding clues about strategies, assets or resources that have been available to their members and that have helped them to deal with the stressor at hand.

A crucial step in investigating resilience is to operationally define it. There are several options available for doing so in quantitative observational research (11). On the one hand, there are resilience scales that allow researchers to measure resilience as a personal characteristic with psychometrically sound item lists (12). These metrics often include aspects of competence and control and self-esteem. However, resilience scales are general and they are not designed to measure resilience in specific contexts or adversities. A downside of using such resilience scales to infer resilience in the context of a low SEP is that they are usually blind to resources that are available in the social network and environment (12).

On the other hand, there are 'a priori' approaches of measuring resilience, which rely on criteria for inferring resilience that are defined beforehand, and that are selected to fit the adversity or particular context in which resilience is investigated. Moreover, the outcome that is used to infer resilience from is attuned to the adversity at hand. An a priori approach is more relevant for investigating resilience in relation to a life course of exposure to a low SEP, because a low SEP can be seen as a chronic exposure that often gives rise to additional

and consequential adversities. Moreover, SEP is associated with health and functioning across the board: from physical to mental aspects and from cognitive to social ones. This implies that resilient older people with a low SEP cannot be identified according to performance on a single domain of functioning only (13), and that it is unlikely that resilience scales based on psychological factors only can fully capture the phenomenon of resilience in the context of a low SEP.

Therefore, the current study employed a multidimensional and longitudinal operational definition of Successful Aging (SA) as a yardstick in the context of a life course of exposure to a low SEP. Furthermore, it examined a broad range of lifestyle, social, and psychological characteristics that are expected to be associated with resilience. In sum, we identified resilient older people on the basis of fulfilling two conditions: 1) exposure to a lifetime of low SEP, and 2) high scores on a previously developed index of SA. Our study aimed to examine which lifestyle, psychological and social characteristics distinguished the resilient group from groups with other combinations of SEP and SA.

## **Methods**

### **Study sample**

LASA is a prospective cohort study among Dutch adults aged 55-84 at baseline, based on a random sample from eleven municipalities in three regions selected for national representativeness. LASA was initiated by the Dutch Ministry for Public Health, Welfare, and Sports to provide insight into the determinants and consequences of changes in physical, cognitive, emotional, and social functioning of older adults in the Netherlands (14,15). The oldest old and men were oversampled, and the baseline response rate was 62%.

From the 3,107 participants enrolled in the baseline measurement in 1992, we included 2,185 participants for whom a longitudinal 'Successful Aging index' score was available from previous research (see Measures). The SA index was based on nine indicators of functioning observed across up to six measurement waves (1992-1993, 1995-1996, 1998-1999, 2002-2003, 2005-2006, and 2008-2009). Only those who participated in at least the first two measurement waves and had valid data on at least eight out of the nine indicators of SA were included. Missing follow-up data after the second wave was handled by the Maximum Likelihood procedure, resulting in a full 16-year estimated trajectory for all participants. Furthermore, in the present study we handled missing data on covariates by applying multiple imputation in SPSS v22 with 20 imputed datasets.

### **Measures**

In line with earlier research on resilience, we identified a resilient group on the basis of a specific combination of adversity and an outcome that can be considered favourable given

the adverse context (11). Adversity constituted chronic exposure to a low SEP, retrospectively measured from early life up to the baseline interview in 1992. The favourable outcome, SA, was based on persistent favourable functioning starting at baseline up until 16 years later. The protective factors potentially distinguishing the resilient group from other groups were taken from the baseline measurement. Following a large number of studies on general explanations of socioeconomic inequalities in health and functioning, we selected characteristics from three domains; lifestyle, social and psychological (16,17), as far as these were available in the LASA database and did not overlap with the measures of SEP and SA.

### *Successful Aging*

For assessing SA, we used a previously developed SA index (18). General features of this index are: 1) it includes subjective and objective indicators of physical, cognitive, emotional and social functioning; 2) for each indicator, at least two distinct types of 16-year longitudinal trajectories were derived using sex-stratified Latent Class Growth Analysis (LCGA (19)). The most favourable types of trajectories were evaluated as 'successful', and were assigned a score of 1 (versus 0 for a relatively unfavourable trajectory); 3) for each individual, we counted the number of indicators in which (s)he had a 'successful' trajectory, and adjusted the resulting score for the statistical uncertainty involved in assigning individuals to a single latent class. The resulting SA index is a continuous variable ranging from 0 to 9. For the current study, SA was divided into 'high' and 'low' by applying a sex-specific median split ( $\geq 5.18$  in women and  $\geq 5.84$  in men).

The nine indicators included in the SA index are: cognitive functioning (based on the Mini-Mental State Examination; (20)); depressive symptoms (based on the Center for Epidemiologic Studies Depression Scale; (21)); self-rated health (based on a single item); emotional support given to others and instrumental support given to others (based on the nine network members with the most frequent contacts, excluding the partner); limitations in mobility and activities of daily living (based on six items); social participation (based on the frequency of participation in 13 different types of organizations); satisfaction with life (based on a single item); and social loneliness (based on the De Jong-Gierveld Loneliness Scale; (22)). More detailed information on the SA index can be found elsewhere (18).

### *Socioeconomic Position*

To define a group that was exposed to socioeconomic adversity throughout the life course, we used three indicators of SEP: education of the father, education of the participant, and occupational skill level of the participant. Because we aimed for a measure that accurately reflected circumstances across the life span, we considered income to be too sensitive to age and employment status and excluded it from our measure of SEP. However, we examined income later as a potential protective factor.

Father's education was measured in years and ranged between 5 and 18. Less than 7 years was defined as low for all participants. Because the distribution of own education and

occupational skill level differed strongly between men and women, we used sex-specific cut-off points for the other aspects of SEP. Own education also ranged between 5 and 18 years. For women, <7 years was defined as low, and for men, <10 years was defined as low. Occupational skill level was based on the SBCg2 (Standard Classification of Occupations (23)) and originally had five categories (elementary, low, medium, high, and scientific). In principle, we used information on the participants' longest-held job. If this information was missing, we used the current job. Participants who never had a paid job were added as a sixth category. For women, we defined never having had a job or elementary skill level as low, and for men, we defined never having had a job, elementary and low skill level as low. Participants who had low positions on all three indicators were defined as having a low SEP. Otherwise, participants had a high SEP.

### *Health and lifestyle factors*

Characteristics in the domain of health and lifestyle included chronic diseases, smoking, BMI and physical activity.

For chronic diseases, participants were asked whether they had the following chronic conditions: chronic non-specific lung disease (including asthma and chronic obstructive pulmonary disease), cardiac disease, peripheral arterial disease, diabetes mellitus, cerebrovascular accident or stroke, joint disorders (including osteoarthritis and rheumatoid arthritis) and cancer. Additionally, participants indicated whether they had any other chronic diseases for which they were treated or experienced symptoms during the last three months. The number of chronic conditions was summed.

Smoking was based on a question that assessed whether the participant currently smoked (1=yes; 0=no). Physical activity expressed the total number of minutes the participant walked, cycled, engaged in sports, or performed light or heavy household activities in the past two weeks. As we found that a few outliers were disproportionally influencing the frequency distribution, we maximized the values to +3 standard deviations, resulting in a scale ranging from 0 – 525 minutes per day. Body Mass Index (BMI) was based on measured body weight and height (weight in kilograms / height in meters<sup>2</sup>) and used as a continuous variable.

### *Social and socioeconomic factors*

In the social and socioeconomic domain, we included partner status, the number of children, income, social support received, social network size, church membership, three neighbourhood characteristics, and life events.

Partner status was measured as having a partner inside the household (1) versus no partner or a partner living outside the household (0). The number of children currently alive ranged between 0 and 15. Net monthly income was asked in 13 categories, and included the partner's income. We transformed income into a continuous measure by taking the median value for each category. If income was not reported at baseline, we used the nearest subsequent



measurement wave (n=232). Then, we corrected these values for inflation and made income comparable between one-person and multiple-person households through multiplying it by 0.7 for participants whose partner contributed to the income (16). The final variable was expressed in 100 euros and ranged between 1.6 and 24.4.

Instrumental support and emotional support received was based on the frequency of support received from the nine social network members with whom the participant had the most frequent contact, excluding the partner (range 0-36). Instrumental support reflected the frequency of getting help in and around the house, whereas emotional support reflected the frequency of talking to others about one's own personal experiences and feelings (24). Network size reflected the total number of social contacts reported by participants, including the partner.

Church membership reflected whether the participant was a member of a church (1=yes; 0=no). This question was not asked at baseline and therefore taken from the next measurement wave (1995-1996).

Social environmental characteristics included neighbourhood social status, neighborhood financial status, and municipal crime rate. Neighbourhood social status was a composite measure based on the average educational level, income and employment status, and ranged from -4 to 4 (25). Neighbourhood financial status was based on rental and purchase prices as well as the average household income in the neighbourhood. This variable ranged between 1 and 5, where 3 indicated about modal financial status (26). Crime rate was measured on the municipality level, and comprised a composite of the frequency of six types of crimes (raid, theft, burglary or housebreaking, theft from car, murder, and threat or robbery), and ranged between 0 and 100 (27).

The number of life events was based on a selection of events scoring high on distress and life change that was applied in previous research on the effects of life events on SA (28). The events included: parental death and severe discord or problems between parents in childhood, and divorce, widowhood, death of a child, unemployment, and occupational disability in adulthood (i.e., before baseline). A sum score was constructed reflecting the number of events reported (observed range: 0 to 4).

### *Psychological factors*

We included five psychological characteristics: sense of mastery, self-esteem, neuroticism, social inadequacy, and self-efficacy. Sense of mastery reflects the extent to which one feels that life chances are under one's own control, rather than determined by external forces. It was measured by a five-item version of the Pearlin Mastery Scale, answered on a Likert scale ranging from 1 (completely disagree) to 5 (completely agree) (29). An example item is "There is little I can do to change important things in my life". The scores were reversed so that the total scale range was 5 – 25, with high scores indicating a higher sense of mastery.

For self-esteem we used a single item with the same response categories as for mastery: "In general, I am satisfied with myself".

Neuroticism and social inadequacy were based on the Dutch Personality Questionnaire (30). Neuroticism, or emotional instability, reflects the tendency of individuals to respond with distress to situations or events. It was based on 15 items, with response categories "does not apply to me" (0); "mostly not applies to me" (1); or "applies to me" (2). The scale range was 0 – 30, and an example item is "I am often nervous".

Social inadequacy measures the extent to which an individual feels ill at ease with other persons and finds it difficult to relate to others. It used the same response categories as neuroticism, and is based on 10 items (scale range 0 – 20), for example "It is hard for me to make new friends".

Perceived self-efficacy reflects the individual's judgment of how well one can effectively take actions that are required to deal with obstacles or events in life. The concept encompasses initiative, efforts to complete initiated behaviours, and persistence in the face of adversity (31). It was measured by a 12-item General Self-Efficacy Scale. Response categories were identical to the mastery scale, resulting in a total range of 12 – 60. An example item is "When I have decided to do something, I will do it".

#### *Religiousness*

Religiousness was assessed by three separate items. First, we included a question on the frequency of prayer, which was answered in eight categories and dichotomized as praying at least once a year or not. As this item was not asked at baseline and first follow-up, we took the item from the 1998-1999 measurement wave assuming that prayer frequency is stable over time. Second, from the second measurement wave (1995-1996) we included a question which asked whether the participant experienced prayer as meaningful: "Do you think praying makes sense for you?" (1=yes; 0=no). Third, from the second measurement wave we included an item that asked to what extent religion influenced the participant's daily life, ranging from 1 (completely disagree) to 5 (completely agree).

#### *Important aspects of life*

At baseline, participants were presented with a list of nine aspects, and asked which three aspects were the most important ones in their lives. The list was adapted from the Netherlands Institute for Social Research (32). For the present study we selected two items hypothesized to be related to SEP and health, which asked whether the participant indicated "good income" and "good physical health" as one of the three most important aspects of life (1=yes; 0=no).

#### *Other covariates*

Age and sex were derived from municipal registries.

### Analytic procedure

We distinguished four groups based on their combination of SEP and SA. The group with low SEP and high SA was labelled 'Resilient' and this group was used as the reference group in all analyses. The other groups were labelled according to their combination of SEP and SA: Low SEP/Low SA; High SEP/High SA; and High SEP/Low SA. Our analytic approach was designed to identify from the large number of included potential protective factors those that most strongly distinguished the Resilient from other groups. In this approach, the comparison with the Low SEP/Low SA group was key, as this difference shows what factors most strongly predict SA at a high level of adversity. However, we also considered the comparison with the High SEP/High SA group to be relevant, as this shows to what extent the characteristics of the resilient were exceptional given their high exposure to socioeconomic adversity.

The analytic approach involved three steps. First, we examined for each protective factor separately whether the Resilient differed significantly ( $p < .05$ ) from those with Low SEP/Low SA, while adjusting for age and sex only ('bivariate models'). If this was the case, the protective factor was selected for the next step. Second, we divided the list of selected variables from step one into sets of variables that covered the same domain (e.g., 'psychological characteristics'). In each of these 'blocks' we identified which variables were independently related to resilience, by testing differences between the Resilient and the Low SEP/Low SA group, adjusted for age, sex and all other protective factors within the domain ('block adjusted models'). Third, we included all variables in which a significant ( $p < .05$ ) difference between the Resilient and the Low SEP/Low SA group remained in a final model. The final model again tested group differences in all selected characteristics, but now adjusted for age, sex, and the selected variables from all block analyses ('fully adjusted models').

Because we used multiple imputation and some pooled estimates were not available by default in SPSS, we used specific procedures to obtain all desired pooled statistics. For continuous protective factors, we obtained adjusted group means using analysis of covariance. Pooled statistical significance of mean differences between the groups was obtained using linear regression models with the protective factor as the outcome and the SEP/SA groups (and covariates) as predictors. For dichotomous protective factors we obtained adjusted percentages in each SEP/SA group by estimating binary logistic regression models without intercepts, in which the dichotomous protective factor was the outcome and the SEP/SA groups (and mean-centred covariates) the predictors. Pooled statistical significance of group differences in these percentages was obtained using logistic regression models with the SEP/SA groups as predictors.

### *Planned sensitivity analysis*

Our main analysis with four groups leads to a relatively heterogeneous high SEP group in terms of their socioeconomic characteristics. Therefore, we planned to repeat our bivariate and multivariate analyses with an alternative grouping using more strict criteria to define an

unambiguously 'high' SEP group. The goal of this analysis was to test the robustness of the differences between the resilient and the high SEP groups. In this analysis, low SEP was defined similarly. Criteria for men were that the father and the respondent had more than 9 years of education, and the respondent had a high or scientific occupational skill level. Criteria for women were the same, except for occupational skill level, for which medium, high or scientific qualified as 'high'. All individuals who did not fulfil criteria for low or high SEP were defined as having 'intermediate SEP'.

## Results

Descriptive statistics showed that differences between the pooled (i.e. imputed) dataset and the observed dataset were largely negligible (Table 1). All variables, except for father's education, were statistically significantly associated with SA in bivariate analyses.

**Table 1.** Descriptive statistics for original and imputed data (n=2,185) and associations with Successful Aging

Variable <sup>b</sup>	Range/ Category	N	Observed	Pooled	Association
			M (SD) / %	%/M	with SA <sup>a</sup> (mean SA)
<b>Demographics</b>					
Age in 1992	55–84	2185	69.2 (8.57)	69.2	$r = -.46^{***}$
Sex	Female	1152	52.7	52.7	(5.2)
	Male	1033	47.3	47.3	(5.6) <sup>***</sup>
<b>Socioeconomic Position</b>					
Father's education (years)	5–18	2062	7.4 (2.93)	7.5	$r = .03$
Respondent education (years)	5–18	2183	9.0 (3.31)	9.0	$r = .22^{***}$
Respondent occupational skill level	Elementary	158	7.2	7.4	(4.6)
	Low	664	30.4	30.9	(5.2)
	Intermediate	734	33.6	34.1	(5.7)
	High/Scientific	304	13.9	14.1	(5.8)
Has a 'Low' SEP	Never paid job	277	12.7	13.5	(4.8) <sup>***c</sup>
	yes	404		18.5	(4.8)
	no	1781		81.5	(5.5) <sup>***</sup>
<b>Successful Aging (trajectories 1992–2008)</b>					
SA-index score	0–9	2185	5.4 (1.89)	5.4	
<b>Protective/Vulnerability factors</b>					
<i>Health and lifestyle factors</i>					
Number of chronic diseases	0–8	2178	1.3 (1.19)	1.3	$r = -.35^{***}$
Current smoker	yes	465	23.8	23.7	(5.2)
	no	1489	76.2	76.3	(5.4) <sup>*</sup>
Physical activity (minutes/day)	0–525	2114	172.8 (112.96)	172.8	$r = .14^{***}$
BMI (kg/m <sup>2</sup> )	16.7–46.2	1897	26.9 (4.03)	26.9	$r = -.14^{***}$

(Table 1 continued)

<i>Social and socioeconomic factors</i>					
Has a partner inside the household	yes	1431	65.5	65.5	(5.8)
	no	753	34.5	34.5	(4.6)***
Number of children alive	0 – 15	2149	2.8 (2.04)	2.8	$r = .09^{***}$
Income (x 100 euros)	1.59 – 24.39	2144	9.3 (4.56)	9.3	$r = .24^{***}$
Instrumental support received	0 – 36	2118	14.1 (8.36)	14.2	$r = .18^{***}$
Emotional support received	0 – 36	2116	21.8 (8.05)	21.7	$r = .37^{***}$
Member of church (1995)	yes	1217	62.6	62.4	(5.6)
	no	727	37.4	37.6	(5.0)***
Network size	0 – 75	2121	14.1 (8.36)	14.0	$r = .36^{***}$
Neighborhood social status (1998)	-4 – 4	2185	-0.2 (0.98)	-0.2	$r = .15^{***}$
Neighborhood financ. stat. (1994)	1 – 5	2184	3.0 (0.9)	3.0	$r = .15^{***}$
Municipal crime rate (2001)	2 – 73	2185	26.7 (29.48)	26.7	$r = -.23^{***}$
Number of life events	0 – 4	2185	0.9 (0.88)	0.9	$r = -.25^{***}$
<i>Psychological factors</i>					
Mastery	5 – 25	2135	17.4 (3.25)	17.4	$r = .35^{***}$
Self-esteem	1 – 5	2128	4.0 (0.8)	4.0	$r = .17^{***}$
Neuroticism	0 – 30	1596	6.1 (5.70)	6.6	$r = -.32^{***}$
Social inadequacy	0 – 20	1581	5.9 (4.94)	6.3	$r = -.26^{***}$
Self-efficacy	14 – 60	2123	42.0 (5.3)	42.1	$r = .28^{***}$
<i>Religiousness</i>					
Praying is meaningful (1995)	yes	1271	65.6	65.3	(5.5)
	no	666	34.4	34.7	(5.1)***
Prays (1998)	yes	1029	68.4	67.5	(5.6)
	no	476	31.6	32.5	(5.0)***
Religion influences daily life (1995)	1 – 5	1932	3.8 (1.08)	3.8	$r = .07^{**}$
<i>Important aspects of life</i>					
Good income	yes	1283	76.1	75.4	(5.5)
	no	402	23.9	24.6	(5.0)***
Good physical health	yes	1297	77.0	76.5	(5.4)
	no	388	23.0	23.5	(5.2)*

a) Based on imputed data for covariates; b) Measured at baseline in 1992, unless indicated otherwise; c) Significance in the original dataset because pooled F-value was not available

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

Applying the sex-specific median split of SA scores ( $\geq 5.18$  in women and  $\geq 5.84$  in men) combined with the high/low SEP dichotomy yielded a group of  $n=158$  resilient participants (Table 2). The group consisted of 54% women, had an average age of 68, and an average SA score of 6.7. This score was comparable to that of the High SEP/High SA group, who had an average SA score of 6.9. In contrast, the average SA score in the Low SEP/Low SA and High SEP/Low SA groups was 3.5 and 3.9 respectively. Average age and the percentage women were highest in the Low SEP/Low SA group ( $M=74$  years and 56% women respectively).

**Table 2.** Identification of a “resilient” group on the basis of low SEP and high SA. Basic characteristics

	Successful Aging <sup>a</sup>	
	High	Low
<b>Socioeconomic Position</b>	<b>Resilient</b>	<b>Low SEP/Low SA</b>
<b>Low (n=404)</b>	<b>n = 158</b> age (mean) = 68 % female = 54 SA score (mean) = 6.7	<b>n = 246</b> age (mean) = 74 % female = 56 SA score (mean) = 3.5
<b>High (n=1781)</b>	<b>High SEP/High SA</b> <b>n = 843</b> age (mean) = 72 % female = 52.0 SA score (mean) = 6.9	<b>High SEP/Low SA</b> <b>n = 939</b> age (mean) = 65 % female = 52.0 SA score (mean) = 3.9

a) Cut-off points on the SA-index are: Women:  $\geq 5.18$ ; Men:  $\geq 5.84$

### Bivariate models

The bivariate analyses comparing the Resilient with other groups showed that the Resilient differed from the Low SEP/Low SA group on most variables (Table 3). For example, the Resilient had on average less chronic diseases, they received more instrumental and emotional support, reported less life events, lived in neighbourhoods with a higher social status and in municipalities with a lower crime rate, had higher mastery and self-esteem, and were more likely to pray. We observed no significant differences with the Low SEP/Low SA group in BMI, income and the percentage indicating that a good income or good physical health are important aspects of life.

Furthermore, many characteristics of the Resilient group were similar to those of the High SEP/High SA group. For example, we observed no statistically significant differences in the percentage smoking, the amount of instrumental and emotional support received, and the number of reported life events. There were also some differences: on average, the Resilient had significantly higher BMI, a higher number of children, lower income, lower neighborhood financial status, lower municipal crime rate, lower self-efficacy, a higher percentage indicating that praying is meaningful and a higher percentage indicating that good physical health is an important aspect of life.

**Table 3.** Bivariate analysis of differences in protective/vulnerability factors between Resilient and other groups, adjusted for age and sex (n=2,185).

Characteristic	Resilient (reference) M (s.e.) / %	Low SEP/ Low SA M (s.e.) / %	High SEP/ High SA M (s.e.) / %	High SEP/ Low SA M (s.e.) / %	Selected for thematic 'block analysis'
<b>Health and lifestyle</b>					
Number of chronic diseases	1.0 (0.09)	1.7 (0.08)***	1.1 (0.04)	1.6 (0.04)***	Block 1
Current smoker (%)	18	29*	17	28*	Block 1
Total physical activity	198 (8.7)	160 (7.2)***	180 (3.7)	164 (3.8)***	Block 1
BMI	27 (0.3)	28 (0.3)	26 (0.2)*	27 (0.2)	No
<b>Social/Socioeconomic</b>					
Partner inside household (%)	80	58***	75	63***	Block 2
Number of children alive	3.5 (0.17)	2.9 (0.14)*	3.0 (0.07)*	2.6 (0.07)***	Block 2
Income (x 100 euros)	7.7 (0.33)	6.8 (0.27)	10.3 (0.14)***	9.3 (0.15)***	No
Instrumental support	16 (0.6)	14 (0.5)**	15 (0.2)	13 (0.3)***	Block 2
Emotional support	24 (0.7)	18 (0.5)***	24 (0.3)	20 (0.3)***	Block 2
Member of church (%)	75	56***	70	54***	Block 2
Network size	16 (0.7)	11 (0.5)***	16 (0.3)	12 (0.3)***	Block 2
Neighborhood social status	-0.1 (0.08)	-0.3 (0.07)*	-0.2 (0.03)	-0.3 (0.04)**	Block 3
Neighborhood financ. status	2.9 (0.07)	2.8 (0.06)	3.1 (0.03)*	2.9 (0.03)	No
Municipal crime rate	15 (2.3)	24 (2.0)**	25 (1.0)***	32 (1.0)***	Block 3
Number of life events	0.8 (0.07)	1.1 (0.06)***	0.7 (0.03)	1.0 (0.03)*	Block 4
<b>Psychological</b>					
Mastery	18 (0.3)	16 (0.2)***	18 (0.1)	17 (0.1)***	Block 5
Self-esteem	4.1 (0.07)	3.9 (0.05)**	4.1 (0.03)	3.8 (0.03)***	Block 5
Neuroticism	5.7 (0.46)	8.5 (0.43)***	4.9 (0.20)	8.0 (0.20)***	Block 5
Social inadequacy	5.6 (0.41)	8.2 (0.36)***	5.4 (0.18)	7.0 (0.18)**	Block 5
Self-efficacy	42 (0.4)	40 (0.3)**	43 (0.2)***	41 (0.2)	Block 5
<b>Religiousness</b>					
Praying is meaningful (%)	78	61**	69*	60***	Block 6
Prays (%)	79	58***	72	63***	No
Religion influences daily life	4.0 (0.09)	3.7 (0.08)**	3.8 (0.04)	3.7 (0.04)**	Block 6
<b>Important aspects of life</b>					
Good income (%)	81	76	79	71*	No
Good physical health (%)	30	34	20**	23	Block 7

\* p<.05, \*\* p<.01, \*\*\* p<.001

### Block adjusted models

Subsequently, we assigned the variables in which the resilient group significantly differed from the Low SEP/Low SA group to thematic 'blocks', indicated in Table 3. All variables from each block in which differences between the resilient and Low SEP/Low SA groups remained statistically significant after adding the other variables from the same block (results not shown) were selected for the final analysis. In block 6, we encountered problems with multicollinearity between 'praying is meaningful' and 'prays' ( $r=0.76$ ). Therefore, from this block we selected only actual praying for the final analysis.

### Fully adjusted model

The differences between the Resilient group and the other groups after adjusting for age, sex and all selected variables from the block analyses, are shown in Table 4. Compared to the Low SEP/Low SA group, the Resilient group demonstrated a low number of chronic diseases and high levels of physical activity, emotional support and mastery, and low levels of social inadequacy. Furthermore, a low percentage smoked, and a high percentage had a partner inside the household and prayed.

The results again indicated that the profile of the resilient group was in many respects comparable to that of the High SEP/High SA group. Compared to that group, on two variables, the scores of the Resilient group were more favourable; they had a higher level of total physical activity (193 versus 174 minutes a day,  $p < .05$ ), and a lower municipal crime rate (19 vs 27,  $p < .01$ ). On the other hand, the Resilient reported significantly more negative life events than the High SEP/High SA group (0.9 versus 0.8,  $p < .05$ ).

### Sensitivity analysis

As the criteria for 'low SEP' were the same in the sensitivity analysis and we used the same selection criteria (i.e., a significant difference between the Resilient and Low SEP/Low SA groups), almost the same variables were included in the fully adjusted model (see Supplement, Table 1 and Table 2). One exception was the municipal crime rate, in which the difference between the Resilient and the Low SEP/Low SA group no longer reached

**Table 4.** Multiply adjusted analysis of differences in selected protective/vulnerability factors between Resilient and other groups, adjusted for age, sex and all protective/vulnerability factors (n=2,185).

	<b>Resilient (reference)</b>	<b>Low SEP/ Low SA</b>	<b>High SEP/ High SA</b>	<b>High SEP/ Low SA</b>
<b>Characteristic</b>	<i>M (s.e.) / %</i>	<i>M (s.e.) / %</i>	<i>M (s.e.) / %</i>	<i>M (s.e.) / %</i>
<b>Health and lifestyle</b>				
Number of chronic diseases	<b>1.0 (0.09)</b>	1.7 (0.08)***	1.0 (0.04)	1.6 (0.04)***
Current smoker (%)	<b>18</b>	28*	16	27*
Total physical activity	<b>193 (8.8)</b>	168 (7.4) *	174 (3.9) *	169 (4.0) *
<b>Social/Socioeconomic</b>				
Partner in the household (%)	<b>81</b>	67*	75	68**
Emotional support received	<b>24 (0.6)</b>	18 (0.5)***	24 (0.3)	20 (0.3)***
Member of church (%)	<b>68</b>	65	71	60
Municipal crime rate	<b>19 (2.2)</b>	21 (1.9)	27 (1.0)**	29 (1.0)***
Number of life events	<b>0.9 (0.06)</b>	1.0 (0.06)	0.8 (0.03)*	0.9 (0.03)
<b>Psychological</b>				
Mastery	<b>18 (0.3)</b>	17 (0.2)***	18 (0.1)	17 (0.1)***
Social inadequacy	<b>6.3 (0.4)</b>	7.4 (0.4)*	5.9 (0.2)	6.5 (0.2)
<b>Religiousness</b>				
Prays (%)	<b>80</b>	66*	75	74

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



statistical significance in the block adjusted analysis. Despite the more strict definition of 'high SEP', most differences between the Resilient and the high SEP groups remained comparable to those found in the main analysis. There were two notable exceptions: in the sensitivity analysis, the percentage with a partner inside the household was now also statistically significantly higher in the Resilient than in the High SEP/High SA group and the difference in the number of life events with this group was no longer significant.

## Discussion

In this study we investigated the characteristics of resilient older adults with a low SEP who participated in the Longitudinal Aging Study Amsterdam. We identified this group on the basis of their scores on a previously constructed index of SA. Overall, our results suggest that the resilient older adults showed favourable profiles across the board, in terms of health and lifestyle, social and psychological factors. Characteristics that most strongly distinguished the resilient older adults from those with a low SEP who aged less successfully included a low number of chronic diseases, low rate of smoking, high emotional support received, high mastery and low social inadequacy, and a high propensity to pray. Moreover, many characteristics of the resilient group were comparable to those of older adults with a high SEP and high SA scores. In terms of physical activity and partner status the characteristics of the resilient group even appeared to be more favourable.

This pattern aligns with the perspective of Baltes' cornerstones governing lifespan development (33), namely the age-related decrease of biological integrity and the age-related increase in the need for culture, where culture refers to psychological, social, material and symbolic resources. When viewed with these cornerstones in mind, it seems that the resilient group had a limited amount of biological deterioration on the one hand, as indicated by their relatively low number of chronic diseases, while maximizing the availability of cultural resources, indicated by the presence of a partner, church membership, praying, the availability of emotional support, high levels of mastery and low social inadequacy. As such, the resilient group was well placed to benefit from an optimal developmental aging process: avoiding some of the root causes of loss of biological integrity, while optimizing the amount of culture that it has available to compensate for any decline.

Furthermore, on many of the factors that we included in our analyses, the scores of the resilient group were comparable to those of the high SEP/high SA group. At first glance, this might mean that we 'merely' identified predictors of SA that operate regardless of SEP. However, in some aspects the resilient group appeared to have more favourable characteristics than the high SEP/high SA group. Particularly, high physical activity, having a partner in the household, and living in municipalities with low crime rates seemed to be particularly relevant as buffers against some of the causes that are usually associated with socioeconomic inequalities in health and wellbeing. A partner may act as an important

source of emotional or instrumental support, whereas being physically active removes one of the most important behavioural barriers toward healthy ageing, i.e. inactivity (34).

Moreover, our finding that many characteristics were similar between the resilient and the high SEP/high SA group can be considered remarkable on its own, given the much lower SEP of the resilient group. It is possible that additional resources and processes that we were not able to measure explain these similarities. Understanding the complete mechanism leading to the profile of characteristics that is associated with resilience may require further in-depth and process-oriented studies, which is beyond the scope of this study. Nevertheless, the combinations of factors emerging from our analyses do clearly suggest that policies to help maintain and improve functioning of people with low SEP should adopt a broad approach, simultaneously enabling and encouraging health-promoting behaviours, while strengthening social support structures and helping people to optimize the benefits of this support structure.

#### *Strengths and limitations*

The main strength of our approach was the availability of a broad range of data and a long follow-up, which allowed us to use an operational definition of successful aging based on longitudinal trajectories of functioning across physical, mental and social domains (18). Furthermore, we were able to use three indicators of SEP, which allowed us to identify a subgroup with unequivocally low SEP. Our decision to exclude income from our definition of low SEP was supported by the finding that income did not significantly differ between both low SEP subgroups. The SA and SEP measures thus made it possible to accurately define a resilient group of older adults. Moreover, we were able to employ a broad range of potential protective factors, with which we identified a detailed profile of the resilient group.

One limitation of the dataset was that it covered predominantly individual characteristics rather than characteristics related to more inclusive systems such as communities or social security arrangements (35). Although we could tap into some neighbourhood and municipality characteristics, factors such as community social capital or community norms and values with regards to help-seeking behaviour were beyond the scope of this paper.

In addition, the choice to use an a-priori approach to resilience required a division of the sample into a few groups. A particular consequence of the division of SEP into low and high was that the high SEP group was relatively heterogeneous. Some of these participants could also have been exposed to adverse socioeconomic circumstances, for example those who experienced downward social mobility. Nevertheless, our sensitivity analysis showed that the distinguishing characteristics of the resilient were largely similar when compared to a more strictly defined high SEP group.

Furthermore, defining participants as resilient on the basis of the overall SA index-score led to some heterogeneity in functional profiles. As the SA index is a count of indicators with a favourable trajectory, the same scores may indicate different profiles of successful and

unsuccessful indicators. This implies that the findings of our study cannot be unambiguously linked to specific (health) outcomes. Nevertheless, our approach does acknowledge the substantial heterogeneity in the functioning of older adults, and therefore of SA, and provides an indication of the factors that may contribute to resilience across multiple functional domains.

Finally, not all components of SA may be equally salient for everyone (36,37). In a more value-based approach, the weight of specific components of a SA index might be adjusted in accordance with participants' values. This we could not do because we lacked such information about our participants, but it may be considered in future studies with comparable aims.

### *Conclusion*

In much of our approach to investigating resilience we followed earlier approaches from the field of developmental psychology. Classic studies in this field include the Kauai Longitudinal Study (9), which found that children who had been exposed to accumulated adversity yet developed into well-functioning young adults against the odds usually had access to a combination of protective factors, operating at the individual, the family and the community level. Developmental psychology has now moved from studies 'merely' identifying such factors to studying the underlying protective processes and designing interventions aimed to promote resilience (38).

It is our view that the gerontological literature has not arrived at this stage yet. This is partly because studies among older adults arguably have a hard task in accounting for the multitude of potential protective factors that could have operated during the life course. Broad descriptive studies like ours may be helpful in marking candidate mechanisms that could be studied further in more process-oriented studies. We believe that by identifying specific health-related, lifestyle, psychological and social characteristics related to resilience, this study provides one of the necessary and useful first steps toward a more elaborate literature on resilience processes in older people with a low SEP. Studies on how particular protective factors operate across the life course in individuals with a low SEP may provide some of the required precision in knowledge for public health efforts aimed at improving the lives of older adults with a low SEP and at reducing socioeconomic inequalities in health and wellbeing.

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## Supplement to Chapter 6

**Supplementary Table 1.** Identification of a “resilient” group on the basis of low SEP and high SA. Basic characteristics. With alternative criteria for ‘High SEP’

Successful Aging <sup>a</sup>		
	High	Low
<b>Socioeconomic Position</b>		
<b>Low (n=404)</b>	<b>Resilient</b> n = 158 age (mean) = 68 % female = 54 SA score (mean) = 6.7	<b>Low SEP/Low SA</b> n = 246 age (mean) = 74 % female = 56 SA score (mean) = 3.5
<b>Intermediate (n=1592)</b>	<b>Intermediate SEP/High SA</b> n = 828 age (mean) = 65 % female = 51 SA score (mean) = 6.9	<b>Intermediate SEP/Low SA</b> n = 764 age (mean) = 72 % female = 52 SA score (mean) = 3.9
<b>High (n=189)</b>	<b>High SEP/High SA</b> n = 110 age (mean) = 66 % female = 60 SA score (mean) = 6.9	<b>High SEP/Low SA</b> n = 79 age (mean) = 72 % female = 46 SA score (mean) = 4.1

a) Cut-off points on the SA-index are: Women:  $\geq 5.18$ ; Men:  $\geq 5.84$

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**Supplementary Table 2.** Multiply adjusted analysis of differences in selected protective/vulnerability factors between Resilient and other groups, adjusted for age, sex and all protective/vulnerability factors (n=2,185).

With alternative criteria for ‘High SEP’ (intermediate groups have been omitted from this table)

Characteristic	Resilient (reference) M (s.e.) / %	Low SEP/ Low SA M (s.e.) / %	High SEP/ High SA M (s.e.) / %	High SEP/ Low SA M (s.e.) / %
<b>Health and lifestyle</b>				
Number of chronic diseases	1.0 (0.09)	1.7 (0.08)***	1.0 (0.11)	1.6 (0.13)***
Current smoker (%)	22	33*	24	32*
Total physical activity	193 (8.7)	168 (7.3) *	151 (10.3) **	147 (12.1) *
<b>Social/Socioeconomic</b>				
Partner in the household (%)	79	65*	61**	63*
Emotional support received	24 (0.6)	18 (0.5)***	26 (0.7)	21 (0.9)**
Member of church (%)	72	67	63	43**
Number of life events	0.9 (0.06)	1.0 (0.06)	0.9 (0.08)	0.9 (0.09)
<b>Psychological</b>				
Mastery	18 (0.3)	17 (0.2)***	18 (0.3)	17 (0.4)***
Social inadequacy	6.3 (0.4)	7.4 (0.4)*	5.5 (0.5)	6.2 (0.6)
<b>Religiousness</b>				
Prays (%)	81	67*	77	83

\* p<.05, \*\* p<.01, \*\*\* p<.001

