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Trajectories of low back pain from midlife to retirement and functional ability at old age

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Background: This study aimed to identify trajectories of low back pain (LBP) over a 16-year follow-up from midlife to retirement and investigate their association with mobility limitations and disability in activities of daily living (ADL-disability) in later life. **Methods:** The study population consisted of 6257 baseline (1981) respondents aged 44–58 years from Finnish Longitudinal study on Aging Municipal Employees. Repeated measurements of LBP were collected in 1985, 1992 and 1997. We studied persons who had data on LBP at baseline and in at least one of the follow-ups and had information on mobility limitations ($n = 2305$) and ADL-disability ($n = 2359$) at a 28-year follow-up in 2009. Latent class growth analysis was used to identify LBP trajectories. Odds ratios (ORs) with 95% confidence intervals (CIs) for the associations of LBP trajectory and later life mobility limitations and ADL-disability were estimated and adjusted for confounders. **Results:** Three LBP trajectories with parallel shapes were identified: high-decreasing (19%), intermediate-stable (60%) and low (21%). After adjustment for confounders, high-decreasing trajectory had 3.2 times the odds (95% CI 2.1–4.9) of mobility limitations and 2.9 times the odds (95% CI 2.0–4.2) of ADL-disability as compared to low trajectory. The respective ORs for intermediate-stable trajectory were 1.6 (95% CI 1.2–2.1) and 1.7 (95% CI 1.3–2.3). **Conclusions:** Among majority of respondents, LBP remained stable over the follow-up. The respondents belonging to intermediate-stable and high-decreasing trajectories of LBP had higher odds of mobility limitations and ADL-disability at old age. This highlights that LBP during midlife to retirement has far-reached consequences on functional ability at old age.

Introduction

Low back pain (LBP) is a common health problem worldwide.[1,2] The median 1-year prevalence of LBP among adult population is around 37% and the prevalence peaks at midlife.[1] LBP imposes severe personal and economic burden for individuals and the society. Research shows that LBP is one of the leading causes for reduced workability at work–life[3,4], sick leaves and premature exit from workforce,[5,6] as well as years lived with disability.[1,7] With population ageing, the burden of LBP is projected to further increase in the future.[7]

Previous studies have demonstrated that a single-point estimate of the presence of LBP is not adequate when investigating the long-term consequences of this condition. Majority of LBP episodes resolve quickly with no severe consequences, yet recurrent episodes and chronicity of pain are also very common. Consequently, LBP is conceptualized as a long-term condition rather than series of unrelated episodes.[8–10] However, little is known about the developmental pathways of LBP and their consequences in the general population. The previous observational studies on the trajectories of LBP have mostly included people who have consulted health care for LBP,[11–14] excluding those without LBP at baseline, over-presenting serious cases and limiting the generalizability of the results beyond clinical populations.

The few earlier population-based studies that investigated the developmental patterns of LBP have shown varying number of different trajectories among adult populations.[15–17] While some have shown fluctuating patterns, courses of back pain with a constant status (back pain always absent or always present), have shown to be the most prevalent, and prior history of back pain a strong predictor of future back pain episodes.[15–17] These results are however mostly limited to a rather short follow-up.[15,16] A British cohort study,[17] with a longer follow-up period, followed participants from the age of 31 years to 68 years, and found four distinct long-term profiles of back pain across adulthood. Two of the identified pain trajectories had fluctuating patterns. Yet, persistent trajectory characterized by no or occasional back pain profile was the most common (58% of the participants).[17]

Maintaining the functional ability at old age is a focus of healthy ageing. It is influenced by health status at different periods across the life course. Cross-sectional evidence indicates that LBP markedly contributes to mobility limitations and disability at old age,[18–21] both of which are crucial markers of functional ability. Mobility is central for independent living and quality of life in older persons,[22] whereas disability is a multidimensional measure, which integrates older individual's intrinsic capacity and the demands that the environment sets. However, there is lack of evidence on the long-term consequences of LBP during midlife to retirement on functional ability at old age.

Earlier studies have shown that older women with severe back pain are more likely to have mobility limitations and difficulties with basic activities of daily living (ADLs),[18] and that LBP account for a large proportion of functional limitations[20] and perceived difficulty in performing functional tasks[19] in older adults. However, the cross-sectional studies lack the ability to determine causality. More importantly, the influence of LBP on functional ability is likely to start early from the working life. According to an established theory, the disablement process is a sequence of transitions from one physical condition to another.[23,24] It begins with some initial pathology that can cause physical impairments that cumulate to cause functional limitations. Functional limitations may eventually lead to disability. Previous research has identified a wide range of factors, including chronic diseases, health behaviors and occupational exposures as determinants of functional decline across the spectrum of the disablement process.[25–27] The aim of the present study is to investigate trajectories of LBP from midlife to retirement and their effects on mobility limitations and disability in old age.

Methods

Study population and design

This study is based on data from The Finnish Longitudinal Study on Aging Municipal Employees (FLAME), which was initiated by the Finnish Institute of Occupational Health in 1981.[28] FLAME is a prospective study on health, workability and working conditions of Finnish municipal workers. A total of 6257 persons aged 44–58 years answered a questionnaire at baseline in 1981 and they were followed in five waves (in 1985, 1992, 1997 and 2009), in total for 28 years. At the last follow-up, the participants were 72–86 years old. Response rate at baseline was 85%.[29]

Data on frequency of LBP were collected similarly at four waves (in 1981, 1985, 1992 and 1997). During the 28-year follow-up, 2079 (33%) of the baseline study population died.[29] The study population of the current study consisted of persons who answered questions about LBP at baseline, and at least in one of the follow-ups and had information available about either of the outcomes; mobility limitations ($n = 2305$) or ADL-disability ($n = 2359$) at the 28-year follow-up.

FLAME study was approved by the ethics committee of Finnish Institute of Occupational Health (Helsinki, Finland). All participants gave written informed consent.

Low back pain

LBP occurrence was queried similarly at four time points. The participants were asked a question: 'Do you have pain or ache in any of the following areas?' Lumbar region accompanied with label 'lumbar spine' was indicated as a separate area on a body mannikin. The response options were never, occasionally and constantly. These original response categories were used in modelling of LBP trajectories.

Outcomes

At the last follow-up in 2009, mobility was assessed using two commonly asked mobility items: self-reported ability to climb three floors of stairs without resting and walk approximately 500 m.[18,20] Level of difficulty encountered while performing these activities was queried. The answer options had four levels, ranging from no difficulty to not possible. The created outcome variable was binary; respondents who reported being able to perform both tasks without difficulties were considered as independent in mobility, whereas respondents who reported being unable to perform the tasks or having difficulties, were considered as having mobility limitations.

To assess disability, the participants were asked about their ability to perform daily activities with a questionnaire on the ADLs.[30] Self-assessed inability to perform or constrains in performing the basic ADLs, is a well-established marker of disability. The respondents were asked whether they had difficulty performing any of five tasks: dressing, bathing, eating, getting in/out of bed, toileting. The response options had five levels ranging from no difficulties to not possible even with help. Disability outcome was dichotomized into disability (any level of difficulty/unable to perform at least one of the ADLs) vs. no disability (no difficulty in any of the tasks).

Baseline covariates

Information on covariates was obtained from the baseline questionnaire. Socio-demographic factors included respondents' sex, age and occupation. Participants were classified into two job categories based on their job profile.[29] The categories were 'white-collar workers' (e.g. office, administrative, teaching and registered nurse) and 'blue-collar workers' (e.g. installation, home care, cleaning and assistant nurse).

Lifestyle factors included alcohol consumption, smoking and leisure-time physical activity (LTPA). Alcohol consumption was categorized as abstinent, moderate or high based on self-reported frequency of consumption of alcoholic beverages (never, $\leq$twice a month, $\geq$once a week, respectively). Based on smoking behavior, subjects were categorized as never smokers, former smokers and current smokers. To measure LTPA, participants were asked how often on average they exercised and strained themselves physically in their leisure time during the previous year. LTPA was classified as low (main activities do not involve moving/physical strain), moderate (some form of exercise $\leq$1 time/week) or high (brisk exercise $\geq$1 h/week).

Body mass index (BMI, kg/m^2) was calculated from participants' self-reported weight and height and categorized into three groups for the analysis ($<$25kg/m^2, 25–30kg/m^2 and $>$30kg/m^2). Information on chronic conditions was based on participants self-reported physician-diagnosed or -treated diseases illnesses or injuries. The following conditions were included: respiratory disease (e.g. chronic obstructive pulmonary disease and asthma), cardiovascular disease (e.g. hypertension and angina pectoris), diabetes, musculoskeletal diseases (e.g. arthritis, degenerative diseases of the back and extremities) and accidental injuries.

Statistical analysis

We used a two-step analytical approach in our study. First, we used latent class growth analysis (LCGA) to classify individuals into LBP trajectories based on individual response patterns to the questions about LBP occurrence during a 16-year follow-up. We used LBP responses from two to four time points. In our analysis, the reported LBP occurrence at each time point was treated as ordinal variable (0 = never, 1 = occasionally, 2 = constantly). LCGA probabilistically assigns individuals into latent groups based upon similar longitudinal data patterns i.e. identifies groups of respondents who share similar experience of LBP over time. Homogeneity of variance within subgroups is assumed.[31] The posterior probability of belonging to each LBP trajectory was obtained for each person, and the subjects were allocated to the trajectory for which the probability was the highest.

We fitted models with one to four classes and selected the best-fitting solution based on several criteria: Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample size adjusted BIC, entropy value, the posterior probabilities and subjective interpretability of the results.[32] According to these fit indices (Supplementary table S1), the decision was made between three- and four-class solutions. Some fit indices (AIC and BIC) favored the four-class solution, however, in terms of classification success and quality, the three-class model performed better as indicated by higher entropy and better posterior probabilities. Each trajectory had a posterior probability greater than 0.80, indicating good class separation in the models.[31,32] Further, in terms of content, interpretation of the results showed that the four-trajectory solution did not introduce meaningfully different trajectory as compared to the trajectories in the three-trajectory solution. Therefore, we chose the three-trajectory solution for further analysis. We used Mplus software V.7.2. for the LCGA.

Baseline characteristics by the derived LBP trajectories are reported as mean and standard deviation (SD) for continuous variables and proportions for categorical variables. Differences between trajectories were examined with chi-square test for categorical variables and analysis of variance for continuous variables.

In the second step of our analytic approach, we conducted adjusted logistic regression analysis to investigate the associations of the derived LBP trajectories with the two separate outcomes: mobility limitations and ADL-disability. We fitted three models for both outcomes. Because the interaction term between sex and LBP trajectory was not significant for ADL-disability, men and women were analysed together and the models were adjusted for sex. However, a statistically significant interaction ($P = 0.042$) between LBP trajectory and sex on mobility limitations, indicated that the association of LBP trajectories and later life mobility limitations might be different for men and women. Therefore, when modelling mobility limitations, we adjusted all the models for this interaction term. In additional sensitivity analyses, we conducted sex-stratified analysis to investigate the possible effect measure modification in the association of LBP trajectory membership and later life mobility limitations by sex. The results of sensitivity analysis are presented in Supplementary Material (Supplementary tables S2 and S3).

Consequently, Model I was adjusted for age and sex when predicting ADL-disability and additionally, for the interaction term for mobility limitations. Model II was further adjusted for occupation type, BMI and lifestyle factors to eliminate their possible confounding role on the estimated ORs. The final model (table 2, Model III) was additionally adjusted for chronic conditions and injuries. The regression analysis was conducted with R version 4.0.0.

Results

Three distinct LBP trajectories were identified, within which participants reported similar patterns of LBP during the 16-year follow-up We named the trajectories according to their level and shape (figure 1) as *low trajectory*, *intermediate-stable trajectory* and *high-decreasing trajectory*. The level and shape of the trajectories were determined by calculating the mean of reported LBP (min 0, max 2) with 95% CI for each trajectory at each time point. The shape of the trajectory was rather parallel in all groups, but the mean of reported LBP differed between the groups at each time point. Supplementary table S4 shows the probability of reporting LBP based on trajectories. Majority of respondents (60%) belonged to *intermediate-stable trajectory*, which mainly consisted of participants likely to systematically report occasional back pain. In *low trajectory* (21% of participants) participants had the highest probability to report never experiencing LBP at each survey. No participants allocated to this trajectory reported constant LBP at any time point. For the *high-decreasing trajectory* (19% of participants) the probability of reporting constant LBP varied from 63% to 80% throughout the follow-up. Some of the respondents allocated to this trajectory reported occasional pain at some time point but were very unlikely to report never experiencing LBP.

The baseline characteristics of the study population by LBP trajectories are described in table 1. The mean age of participants was 49.6 (SD 3.4) years and majority of them were women (63%). The mean age or the sex distribution did not differ between LBP trajectory membership. People in high-decreasing LBP trajectory were more often blue-collar workers, smokers, physically inactive in their leisure-time and had a higher BMI as compared to members of intermediate-stable and low LPB trajectories. People in high-decreasing and intermediate-stable LBP trajectories reported chronic conditions more often than their counterparts in low LBP trajectory.

Modelling of the distal outcomes

The estimates [ORs and their 95% confidence intervals (CIs)] for associations of LBP trajectories with mobility limitations and ADL-disability are presented in table 2. A strong association of LBP trajectory with mobility limitations and ADL-disability was found. Accounting for participants age, sex and the interaction term between LBP trajectory and sex (table 2, Model I), the odds of mobility limitations were highest for those belonging to high-decreasing trajectory followed by those belonging to intermediate-stable trajectory as compared to those belonging to low trajectory. In the fully adjusted model (table 2, Model III), the gradient remained. The odds ratio (OR) for mobility limitations for high-decreasing trajectory was 3.2 (95% CI 2.1–4.9) and for intermediate-stable trajectory 1.6 (95% CI 1.2–2.1) as compared to those in low trajectory.

Those in high-decreasing trajectory and in intermediate-stable trajectory had higher odds of ADL-disability as compared to those in low trajectory in sex- and age-adjusted model. Further adjusting for occupation type, BMI and lifestyle factors (Model II) attenuated the ORs but they remained statistically significant. Similarly, adjustments for chronic conditions and injuries further attenuated the ORs for both the trajectories (Model III). Yet, the odds for ADL-disability were significantly higher for those inintermediate-stable trajectory [OR 1.7 (95% CI 1.3–2.3)] and in high-decreasing trajectory [(OR 2.9 (95% CI 2.0–4.2)] compared to low trajectory.

The non-null interaction term between LBP trajectory and sex indicated possible effect measure modification in the association of LBP trajectories and mobility limitations by sex. Therefore, in additional analysis, we investigated the odds of mobility limitations in different LBP trajectories separately for men and women (Supplementary table S3). The results of these sensitivity analyses are presented in Supplementary Materials.

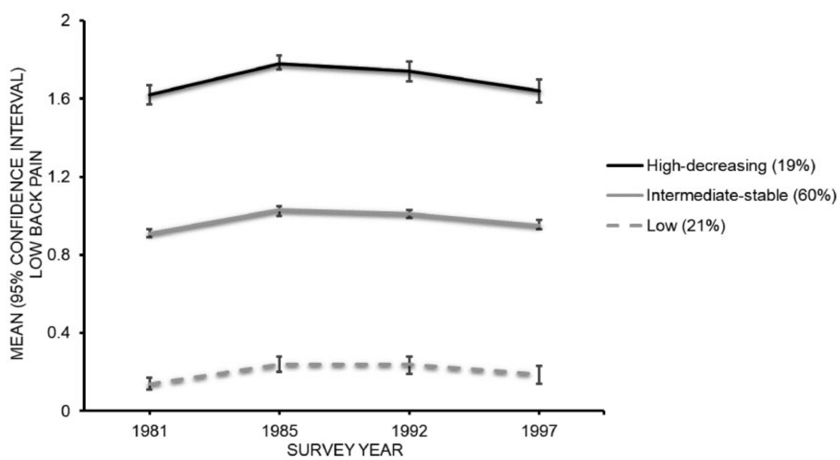

Figure 1 Trajectories of self-reported LBP (0 = never, 1 = occasionally, 2 = constantly) for Finnish municipal workers ($n = 2881$) from 1981 to 1997

Table 1 Participant baseline characteristics by LBP trajectory membership

	All ($n = 2436$)	LBP trajectory Low ($n = 521$)	Intermediate-stable ($n = 1449$)	High-decreasing ($n = 466$)	*P*-value for difference
Women, %	63	62	63	63	0.838
Age, years, mean (SD)	49.6 (3.4)	49.4 (3.4)	49.6 (3.3)	49.8 (3.4)	0.232
LTPA, %					0.009
Low	6	5	7	7	
Moderate	42	36	43	45	
High	52	59	50	48	
Job category, %					<0.001
White-collar workers	58	75	56	43	
Blue-collar workers	42	25	44	57	
BMI					<0.001
<25 kg/m^2	50	59	49	45	
25–30 kg/m^2	42	35	43	45	
>30 kg/m^2	8	7	8	10	
Alcohol consumption, %					0.953
Abstinent	74	75	74	75	
Moderate	18	18	19	17	
High	7	7	7	8	
Smoking, %					0.037
Never	64	67	63	64	
Former	25	23	26	22	
Current	11	10	11	14	
Chronic conditions, %					
Respiratory disease	10	5	10	19	<0.001
Cardiovascular disease	17	13	18	23	<0.001
Musculo-skeletal disease	35	5	35	69	<0.001
Diabetes	2	1	2	1	0.316
Accidental injury	10	3	9	19	<0.001

Table 2 ORs and their 95% CIs for ADL-disability[a] and mobility limitations[b] in old age according to LBP trajectory membership in a 28-year follow-up study

LBP-Trajectory	*N*	Cases *N* (%)	Model I[c] OR (95% CI)	Model II[d] OR (95% CI)	Model III[e] OR (95% CI)
			ADL-disability ($n = 2359$)		
Low	521	65 (13)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Intermediate-stable	1449	347 (25)	2.2 (1.7–3.0)	2.0 (1.5–2.7)	1.7 (1.3–2.3)
High-decreasing	466	184 (42)	4.9 (3.5–6.8)	4.0 (2.9–5.6)	2.9 (2.0–4.2)
			Mobility limitations ($n = 2305$)		
Low	491	197 (40)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Intermediate-stable	1381	760 (55)	2.1 (1.6–2.7)	1.8 (1.3–2.4)	1.6 (1.2–2.1)
High-decreasing	433	305 (70)	4.7 (3.3–6.9)	4.0 (2.7–6.0)	3.2 (2.1–4.9)

[a]ADL-disability: some degree of difficulty in ADL tasks vs. no difficulty in ADL tasks.
[b]Mobility limitations: some degree of difficulty in walking 500 m/climbing stairs vs. no difficulty.
[c]Adjusted for age and sex (+ interaction term: LBP trajectory × sex for mobility limitations).
[d]Adjusted for Model I + occupational group, alcohol intake, smoking, BMI and LTPA.
[e]Adjusted for model II + chronic conditions (cardiovascular disease, respiratory disease, musculoskeletal disease, diabetes) and accidental injuries.

Discussion

Using longitudinal data on a comprehensive and representative sample of Finnish municipal workers, we found three distinct trajectories of LBP from midlife to retirement. Moreover, we found that people in high-decreasing and intermediate-stable trajectories had markedly higher odds of functional limitations at old age as compared to people in low trajectory. The results provide novel epidemiological evidence on the developmental pathways of self-reported LBP from midlife to retirement. More notably, our study is, to our knowledge, the first to shed light on the consequences of long-term back pain experienced from mid-life to retirement on the functional ability at old age.

The trajectories of LBP

Three distinct LBP trajectories were emerged across the 16-year follow-up, from midlife to retirement. Majority of the respondents belonged to intermediate-stable trajectory, one-fifth in low trajectory and less than a fifth were classified into high-decreasing trajectory, in which the respondents were likely to report continuous pain at each wave.

Long-term LBP trajectories have previously been studied mostly among clinical populations.[11–14] Our findings are in line with these studies, which have demonstrated that the different developmental pathways of pain are rather stable over time. One study[12], among a cohort of adults in their 30s to 50s, which found four distinct

Table 3 Baseline characteristics of those included and excluded (were lost to follow-up or died during follow-up) in the study

	Included ($n = 2436$)	Died during follow-up ($n = 2110$)	Lost to follow-up ($n = 1711$)	p for difference
Age, years, mean (SD)	49.6 (3.4)	51.6 (3.6)	50.2 (3.6)	<0.001
LTPA, %				<0.001
Low	6	12	8	
Moderate	42	46	41	
High	52	42	51	
Job category, %				<0.001
White-collar workers	58	36	48	
Blue-collar workers	42	64	52	
BMI				<0.001
$<25 kg/m^2$	50	41	47	
$25–30 kg/m^2$	42	46	45	
$>30 kg/m^2$	8	13	8	
Alcohol consumption, %				<0.001
Abstinent	74	59	73	
Moderate	18	24	19	
High	7	17	8	
Smoking, %				<0.001
Never	64	40	61	
Former	25	28	24	
Current	11	32	15	
Chronic conditions, %				
Respiratory disease	10	15	11	<0.001
Cardiovascular disease	17	31	18	<0.001
Musculo-skeletal disease	35	35	27	<0.001
Diabetes	2	4	2	<0.001
Accidental injury	10	17	11	<0.001
LBP, %				<0.001
Never	27	24	24	
Occasional	58	56	58	
Constant	15	21	18	

trajectories of self-reported back pain over a 6-month period, showed that 7 years later most had remained in the same trajectory. Similarly, a systematic review of prospective studies of patients with chronic LBP from the primary care setting, showed that among those suffering from LBP 65% still experience pain after 12 months.[33]

However, previous long-term studies on LBP trajectories among the general population are scarce. A systematic literature review[34] of the natural course of LBP included eight studies of which four investigated the general population and had a follow-up of 1–10 years. Our results add to the evidence from these studies, which overall show that the status of LBP is relatively stable over time. Our long-term follow-up study showed that majority of persons having suffered from LBP will experience recurrent episodes or continuous pain, whereas those free of LBP at baseline are likely to continue to be free over a long period.

Consequences of LBP on later life mobility and disability

We applied a life-course approach whereby LBP during earlier stages of life were hypothesized to have long-term effects on later life functional ability. Our results show that those free of LBP in mid-life may expect to experience the late years of life more independently and in better health than those who report either occasional or constant LBP at an earlier life stage. After adjustments for several confounders, people in high-decreasing LBP trajectory had approximately 3 times the odds of mobility limitations and ADL-disability as compared to low trajectory. Also, intermediate-stable LBP trajectory had significantly higher odds for both outcomes as compared to low LBP trajectory. This shows that, self-reported LBP, whether occasional or constant, imposes a risk for limitations in functional ability at later life. Although extensive research has shown the adverse long-term consequences of other chronic conditions, this was the first study to show the contribution of LBP during midlife on functional disabilities at old age.

From previous literature, we identified several factors that are associated with an increased risk of LPB[2] and functional limitations.[35] These covariates were conceptualized as complementary causes of functional decline rather than mediators of the association. Adjusting for these variables attenuated the ORs between the LBP trajectory groups, confirming their confounding role. As data on covariates were collected at baseline and the LBP trajectory membership was determined by responses at four consecutive time points, possibility of reverse causation was minimized. It is however likely, that the relationship of LBP with some of the covariates is reciprocal. The focus of the current study was the total effect of LBP on later-life functional limitations therefore we did not consider in our analysis the variability of the covariates over time. Adjusting for potential intermediate variables could have biased the total estimates. Accordingly, we did not include any psychological or psychosocial factors in our models. Although associated with LBP and functional limitations,[36,37] their role on the causal pathway and the temporal relationship is not fully understood. An important topic for further research is the causes and modifying factors that link LBP to functional decline at old age.

Repeated, identical measurements of LBP across four occasions over 16 years are the major strength of our study. Previous studies on LBP have shown that the condition is not adequately described by a single overall population average,[8] therefore the use of growth trajectory modelling to identify latent trajectories of LBP additionally strengthens our study. However, some limitations should be considered. First, as we studied a cohort of public sector workers, this limits the generalizability of our findings to more general populations, e.g. to those unemployed. Secondly, the used two-step approach, according to which the respondents are first classified into trajectories and then the derived trajectories are associated with distal outcomes, ignores the non-zero classification error. This has shown in some cases to attenuate the actual effects.[38] Thirdly, our results are limited by loss to follow-up as restricted number of participants were included in analyses, and completion of follow-up was influenced by baseline characteristics. Approximately 33% of the baseline respondents died during the follow-up. Attrition analyses (table 3) showed that they were older, more often women and in blue-collar occupations than those included. Also, detrimental lifestyles (smoking, alcohol consumption and physical inactivity) and chronic conditions were more common among those who died. Notably, they reported constant LBP at baseline more often than those included. Similar, yet milder differences were found between the included participants and those who were lost to follow-up due to other reasons than death. Consequently, selective loss to follow-up may have led to underestimation of the actual differences in functional ability at old age between people with different LBP trajectories. Finally, lack of information about LBP at time between data collection points is a limitation. Based on these data, it cannot be concluded whether the reported LBP was a manifestation of recurrent or persistent LBP. The fit indices (Supplementary table S1) however show that the classes were well separated. That is, with the growth analysis we were able to successfully classify the respondents into groups which clearly differ in terms of LBP. In future studies more frequent follow-up data are warranted to examine the persistent/episodic nature of LBP. Also, more detailed data on LBP, such as duration and intensity of pain, should be considered.

Conclusions

Among majority of respondents, LBP remained relatively stable over the 16-year follow-up. The respondents belonging to intermediate-stable and high-decreasing trajectories of LBP had higher odds of mobility limitations and ADL-disability at old age. These results show that LBP experienced during midlife to retirement imposes a risk for subsequent functional ability.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflict of interest: None declared.

Key points

- This cohort study among Finnish municipal workers found three distinct, persistent developmental pathways of low back pain during a 16-year follow-up from midlife to retirement: high-decreasing, intermediate-stable and low.
- Members of the high-decreasing and the intermediate-stable trajectories had markedly higher odds of mobility limitations and ADL-disability at old age as compared to members of the low trajectory.
- These results highlight the importance of management and prevention of LBP during midlife, not only to reduce the population burden of LBP, but also to maintain functional ability at later life and to promote a healthy ageing.

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