CHAPTER 2

The role of overweight during the life course in functional decline of men and women aged 55-65 years

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Abstract

Objectives: Future generations of older adults will experience a longer duration of overweight. We studied the association between overweight history and prevalent and incident functional limitations in late middle age.

Methods: Data of participants of the Longitudinal Aging Study Amsterdam (LASA) aged 55-65y were used. Current BMI and recalled weight history were determined at baseline (2001/02)(n=860). Functional limitations were assessed by self-report at baseline and after 3 years (n=770).

Results: The prevalence of functional limitations increased significantly over the four overweight-patterns found: never(reference), only current overweight, overweight since age 40y, and overweight since age 25y. Odds ratios (95%CI) for prevalent functional limitations were 1.3 (0.9-2.1), 2.4 (1.6-3.8) and 2.0 (1.3-3.2). Prospectively, the odds for increased functional limitations was higher with a longer overweight history. Adjustment for socioeconomic and lifestyle factors, chronic disorders, and grip strength did not substantially change the associations. Both the cross-sectional and the prospective associations were strongly attenuated by current BMI.

Conclusions: A longer overweight history is associated with more and increasing functional limitations at late middle age. The higher current BMI of persons with longer overweight history plays an important role in the associations.

Introduction

Worldwide, the prevalence of overweight and obesity is rising among all age groups (1). In most Western countries, the prevalence of overweight and obesity is highest among persons aged 60 to 70 years (2). Because the prevalence has also been increasing among young people and most people tend to gain weight over the life course (3), increases of lifetime cumulative exposure to excess weight in future generations are expected (4).

It is generally known that overweight and obesity are associated with a wide range of poor health outcomes and functional limitations in older adults (5, 6). Moreover, overweight at young adult age (25y) has been shown to be associated with functional limitations at late middle age (45-65y) (7). Previous studies have also reported a cumulative effect of obesity over the lifespan on functional outcomes. Trends of longer overweight history in relation to mobility limitations and lower physical performance have been previously reported in older adults (8-10). Whether or not this cumulative effect of overweight is already influencing functional status at late middle age has not been clarified. In addition, the role of current BMI in the association of overweight history and functional limitations remains unclear. Finally, to our knowledge, no study has prospectively investigated the role of overweight history in the incidence of self-reported functional limitations in late middle age.

In the current prospective study we aimed to assess whether longer overweight duration during the life course influences (change in) functional status at late middle age.

Methods

Study sample

The sample consisted of participants of the Longitudinal Aging Study Amsterdam (LASA). Ten years after the initial LASA sample was drawn, a second sample of 1002 participants (cooperation rate 62%) aged 55-64 years was drawn in 2002-2003 according to the same procedures used for the initial sample. In the current study, data derived from the second LASA sample were used. Details on the

sampling and data collection procedures were described elsewhere (11, 12). The population based sample was drawn from the population registers of 11 municipalities in three distinct regions of the Netherlands stratified by age, sex, urbanisation grade and expected five-year mortality. A follow-up measurement took place three year after the baseline measurements in 2005-2006 (n=908). Measurement cycles consisted of a main and a medical interview conducted by an especially trained interviewer at the participants' home. Participants with complete data on overweight history and functional limitations at baseline were included in the analyses (n=899). In the prospective analyses, 770 participants with complete data on functional limitations at follow-up were included. For the analyses of incident functional limitations, 538 participants without any functional limitations at baseline were included.

Anthropometric measurements

Anthropometric measures were assessed by a trained nurse as part of the medical examination at baseline. To measure height, a stadiometer was used, which measured to the nearest 0.001 m. Body weight was measured to the nearest 0.1 kg in subjects wearing light clothing only, using a calibrated scale. BMI was calculated as measured body weight (kg) divided by measured height (m) squared. Weight at ages 25 and 40 years were assessed by self-report as part of the medical interview. Measured height at baseline was used to calculate BMI at ages 25 and 40 years. At every age, participants were considered overweight when their BMI was ≥25 kg/m^2, and obese when their BMI was ≥30 kg/m^2.

Functional limitations

Self-reported functional limitations were assessed as part of the main interview using seven questions: "Can you walk up and down a staircase of 15 steps without resting?", "Can you use your own or public transportation?", "Can you cut your own toenails?", "Can you dress and undress yourself?", "Can you sit down and stand up from a chair?", "Can you walk outside during five minutes without stopping?", and "Can you take a shower or bathe?". The response categories were: "No, I cannot" (score 1), "Only with help", "Yes, with much difficulty", "Yes, with some difficulty", and "Yes, without difficulty" (score 5). A total score of all

seven items ranging from 7 to 35 was calculated, with a lower score indicating a worse functional status and thus more functional limitations (Cronbach's α = 0.80). The score was used as a continuous as well as a dichotomous variable. Participants who reported any difficulty on one or more of the items were considered functionally limited.

Covariates

Sociodemographic factors

Sex, age, education, and living arrangement (living alone or not) of the participants were obtained. Participants were asked for their highest education level completed, ranging from primary to university education. Responses were categorized as low (elementary school or less), moderate, and high (higher vocational, college or university education).

Lifestyle factors

Smoking behaviour was assessed by self-report (never, former, current). The validated LASA Physical Activity Questionnaire (LAPAQ) was used to assess physical activity (min/day) of the previous two weeks (13). Information on the frequency and duration of walking outdoors, bicycling, light and heavy household activities and a maximum of two different sport activities was obtained. Three categories of alcohol consumption (drinks/week) were constructed, 0 (non-drinkers), 1-7 drinks/week (light drinkers) and >7 drinks/week moderate to heavy drinkers.

Chronic diseases

The presence of chronic diseases was assessed by self-report during the main interview. Chronic diseases included were chronic pulmonary disease, cardiac disease, diabetes mellitus, arthritis, stroke and peripheral atherosclerosis (14). Depressive symptoms were measured using a Dutch version of the Center for Epidemiologic Studies Depression (CES-D) scale (range 0-60) (15).

Grip strength

Grip strength was measured as part of the medical interview using a hand-held strain-gauged dynamometer (Takei TKK 5001, Takei Scientific Instruments Co. Ltd,

Tokyo, Japan). The dynamometers were regularly calibrated and checked for any abnormalities. Individual adjustments for hand size were made. Participants had two attempts with each hand in standing position with their arm alongside the body. The mean of the maximal strength within each hand was calculated in kilograms.

Statistical analyses

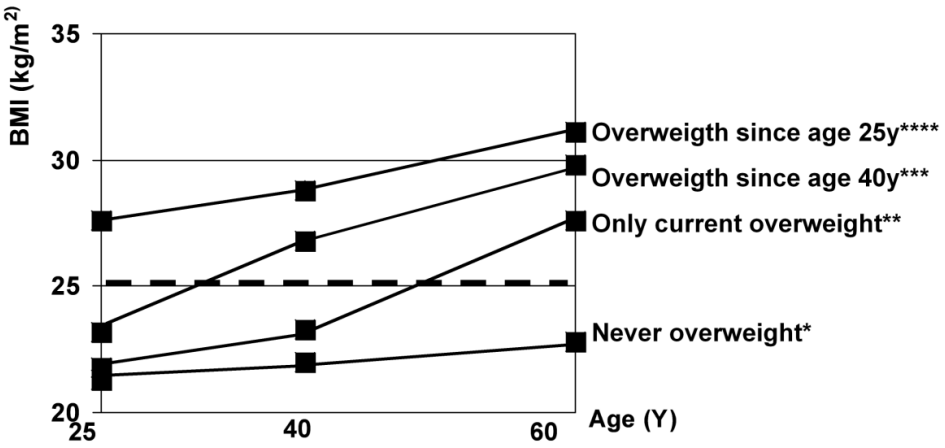
Trajectories of overweight and obesity over the life course were assessed based on the BMI of the participants at ages 25y, 40y and 55-65y, resulting in four main patterns of overweight history ranging from 'never overweight' to 'overweight since age 25 years'. The characteristics of the participants were compared by these overweight history groups. Associations between overweight history groups and categorical variables were tested using the $\chi 2$ test. By means of one way ANOVA, crude associations between overweight history groups and continuous variables were tested. Trends across the overweight history groups were tested by using the categorical variable continuously in the regression models. Cross-sectionally, we analyzed the possible associations of overweight history with prevalent functional limitations using multiple logistic regression analyses. Prospectively, the change in functional limitations score (continuous variable) between baseline and follow-up was calculated, and the association with overweight history was assessed using linear regression analyses. Also, the association of overweight history and any functional decline (dichotomous) was assessed using logistic regression models. These prospective analyses were adjusted for baseline functional limitations. Finally, logistic regression analyses were used to analyze the association with incident functional limitations after three years of follow-up in participants without any functional limitations at baseline. Possible confounding on the associations by selected co-variates was assessed by stepwise adding these variables to the regression models. Furthermore, interaction effects between overweight history and sex, education, living arrangement, physical activity, grip strength and current BMI were tested by adding interactions terms to the regression model and these were considered relevant when $P \leq 0.1$. All analyses were done using SPSS 17.0.

Results

Patterns of overweight

Data on overweight history and functional limitations were complete for 899 participants at baseline. Four major, distinct patterns of overweight history could be identified; a never overweight group, an only current overweight group, a group of people who were overweight since the age of 40 years and a group of people who were overweight since the age of 25 years (Figure 1). Only 28 overweight people lost weight and achieved a normal weight at later age. Overweight status fluctuated in 11 persons. These groups were too small to be considered as a separate group in the statistical analyses, so they were excluded from the analyses. In the cross-sectional analyses, 860 participants with an overweight history according to one of the identified patterns were included.

Figure 1. Mean BMI at ages 25, 40 and 60 years of 860 older men and women, participants of the Longitudinal Aging Study Amsterdam (LASA), according to their overweight history pattern. At each age, participants were considered overweight when having a BMI over 25 kg/m^2.



* n=246, ** n=252, *** n=201, **** n=161

Complete data on functional limitations after three years of follow-up were obtained in 770 participants of whom 538 did not have any functional limitations at baseline and were thus at risk for developing new functional limitations.

Characteristics

At baseline, the mean age of the participants in our study sample was 59.9 (SD 2.9) years and there were no age differences between the overweight history groups. Men were more likely to already have overweight at earlier ages, while women were more likely to maintain a healthy weight or to develop overweight at middle age. Details on differences of covariates between overweight history groups can be found in Table 1.

Cross-sectional analyses

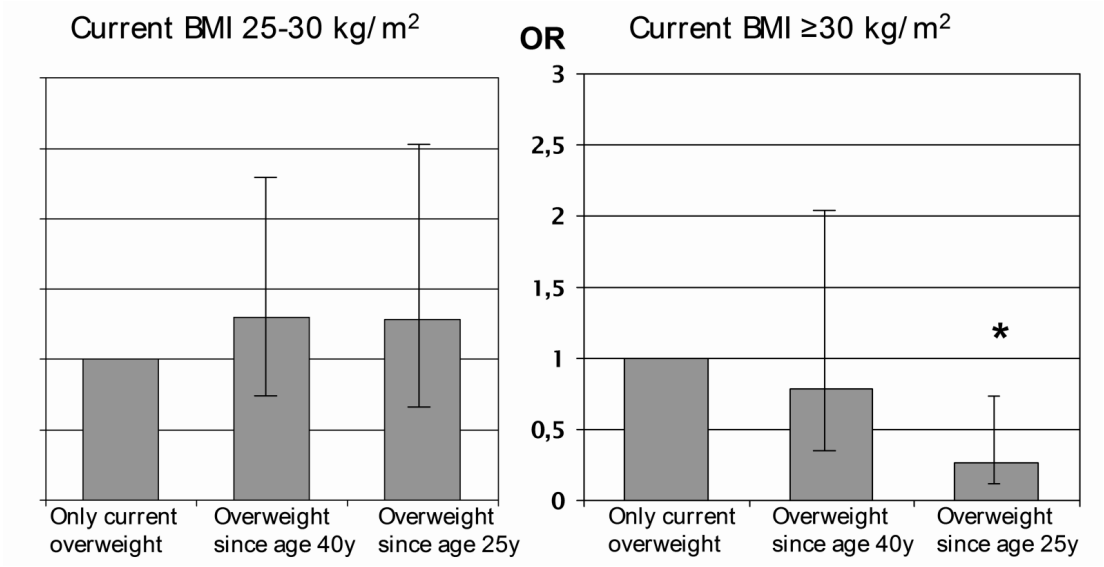
At baseline, participants with a longer overweight history had lower mean scores on the functional status questions, indicating more functional limitations (Table 2). Also, the percentage of participants reporting any difficulties was highest among participants with lifetime overweight. Significant trends across the overweight history categories were found.

After adjustment for sex and education participants who were overweight since the age of 40y and 25y were more likely to report any functional limitations compared to those who were never overweight (Table 2). The odds ratios (ORs) (confidence interval (CI)) were 2.40 (1.55-3.74) and 2.02 (1.26-3.23), respectively (model 1). The ORs were somewhat attenuated by adding lifestyle factors and chronic disorders to the model (models 2 and 3) and became stronger by additional adjustment for grip strength (model 4). Although there was a significant trend across the overweight history groups according the first four models, none of the models showed that the OR for the participants who were only currently overweight was significantly different from those who were never overweight. In a final step, after inclusion of current BMI to the model, the association between overweight history and functional limitations disappeared (OR: 0.84 (0.44-1.59) and 0.55 (0.25-1.14)) (model 5).

A significant interaction was found between current BMI and the overweight history groups. Subsequently, the analysis of the association of overweight history

with functional limitations was stratified for currently overweight (n = 416) and currently obese persons (n = 198). No association between overweight history and functional limitations was found in participants with a current BMI of 25- 30kg/m^2 (Figure 2, left panel). However, a significant trend across the overweight history groups was found in participants with a current BMI of ≥30 kg/m^2. Those who were overweight since the age of 25y had a four fold lower odds for functional limitations as compared to the participants who were only overweight at middle age (OR 0.26 (0.10-0.72) and gained weight rapidly between age 40 and 60 years (Figure 2, right panel). The odds ratio in currently obese participants who were overweight since age 40y was not significantly different from the only current overweight group (OR 0.78 (0.30-2.05)).

Figure 2. Odds ratios of the adjusted association between overweight history and prevalent functional limitations, stratified by current BMI category.



* Significant negative trend across the overweight history groups.

**Analyses adjusted for sex, education, smoking, physical activity, heart disease, diabetes, stroke, cancer, grip strength and current BMI.

Table 1. Baseline characteristics of the study population.

	Never overweight (n=246)		Only current Overweight (n=252)		Overweight since age 40y (n=201)		Overweight since age 25y (n=161)		P-value
Sex (% male)	39.0		41.7		55.7		55.9		<0.01
Age (y)	59.7	(59.3-60.1)	60.0	(59.7-60.4)	59.8	(59.3-60.2)	60.1	(59.7-60.6)	0.36
BMI at baseline (kg/m2)	22.8	(22.6-23.0)[2]	27.6	(27.3-27.9)[1]	29.8	(29.3-30.3)[1,2]	31.3	(30.7-31.9)[1,2]	<0.01
BMI at age 25 (kg/m2)	21.3	(21.1-21.6)	21.8	(21.6-22.0)	23.2	(23.0-23.4)[1,2]	27.6	(27.1-28.0)[1,2]	<0.01
BMI at age 40 (kg/m2)	22.0	(21.8-22.2)[2]	23.3	(23.1-23.4)[1]	26.8	(26.5-27.1)[1,2]	28.8	(28.3-29.3)[1,2]	<0.01
Living alone	20.7		13.9		13.4		19.3		0.09
Education									<0.01
Low (%)	15.0		19.4		19.9		29.2		
Median (%)	59.3		59.9		55.2		57.1		
High (%)	25.6		20.6		24.9		13.7		
Smoking status									0.02
Never smoker (%)	25.6		25.0		27.4		15.5		
Former smoker (%)	42.3		48.4		41.3		58.4		
Current smoker (%)	32.1		26.6		31.3		26.1		
Alcohol use									0.63
Non drinker	7.3		7.9		8.0		8.1		
<1-7 drinks/week	48.0		48.0		46.3		43.5		
>7 drinks/week	44.7		44.0		45.8		48.4		
Physical activity (min/day)	181.7	(167.2-196.3)	171.7	(158.3-185.1)	149.4	(134.3-164.5)[1]	160.9	(142.3-179.4)	0.02
Depression (0-60)	7.7	(6.8-8.5)	7.7	(6.8-8.6)	7.6	(6.6-8.7)	7.8	(6.7-8.9)	0.99
N of chronic diseases	1.1	(0.9-1.2)[2]	1.5	(1.3-1.6)[1]	1.6	(1.4-1.8)[1]	1.7	(1.5-1.9)[1]	< 0.01
Lung diseases (%)	9.3		8.7		12.9		9.3		0.46
Heart diseases (%)	7.3		9.1		13.9		19.3		< 0.01
Osteoarthritis (%)	27.3		34.5		32.3		31.1		0.38
Atherosclerosis (%)	3.7		4.4		7.5		5.6		0.29
Diabetes (%)	3.3		4.4		10.9		11.2		< 0.01
Stroke (%)	1.6		3.6		2.0		6.2		0.05
Cancer (%)	10.2		11.1		4.0		7.5		0.04
Grip strength (kgf)	33.0	(31.7-34.2)	35.1	(33.7-36.5)	37.9	(36.2-39.6)[1,2]	38.3	(36.3-40.2)[1,2]	> 0.01

[1] significantly different from never overweight group P ≤0.05; [2] significantly different from only current overweight group P ≤0.05

Table 2. Cross-sectional associations between overweight history groups functional limitations at baseline.

Baseline functional limitations (n = 860)	**Never overweight**	**Only current overweight**		**Overweight since age 40y**		**Overweight since age 25y**		**P-value for trend**
Functional limitations score (7-35)	34.2 (33.8-34.5)	33.9 (33.6-34.2)		33.7 (33.3-34.0)		33.2 (32.6-33.8)		> 0.01
Any functional limitations (%)	20.7	27.4		37.3		38.5		> 0.01
OR for any functional limitations		OR	95% CI	OR	95% CI	OR	95% CI	
Model 1	Ref.	1.34	0.87-2.07	2.40	1.55-3.74	2.02	1.26-3.23	> 0.01
Model 2	Ref.	1.31	0.85-2.03	2.29	1.47-3.57	1.96	1.22-3.16	> 0.01
Model 3	Ref.	1.28	0.82-1.98	2.23	1.42-3.50	1.77	1.09-2.88	> 0.01
Model 4	Ref.	1.44	0.92-2.26	2.63	1.65-4.19	2.14	1.29-3.53	> 0.01
Model 5	Ref.	0.66	0.38-1.13	0.84	0.44-1.59	0.55	0.25-1.14	0.26

Model 1 adjusted for socio-demographic factors (sex, education), Model 2 additionally adjusted for lifestyle factors (smoking, physical activity), Model 3 additionally adjusted for chronic disorders (heart disease, diabetes, stroke and cancer), Model 4 additionally adjusted for grip strength, Model 5 additionally adjusted for current BMI.

Table 3. Prospective associations between overweight history groups and functional limitations after 3 years of follow-up.

Decline functional status (n=770)	**Never overweight**	**Only current overweight**		**Overweight since age 40y**		**Overweight since age 25y**		**P-value for trend**
Change functional limitations score	-0.19 (-0.40-0.00)	-0.24 (-0.50-0.01)		-0.44 (-0.80- -0.07)		-0.45 (-0.86- -0.03)		0.53
Any functional decline (%)	17.6	22.7		31.7		22.7		0.01
OR for any decline functional status		OR	95% CI	OR	95% CI	OR	95% CI	
Model 1	Ref.	1.22	0.76-1.96	1.91	1.17-3.10	1.26	0.73-2.16	0.14
Model 2	Ref.	1.24	0.77-2.00	2.00	1.23-3.27	1.23	0.71-2.12	0.14
Model 3	Ref.	1.20	0.74-1.96	2.03	1.23-3.35	1.09	0.62-1.92	0.16
Model 4	Ref.	1.33	0.81-2.18	2.34	1.40-3.90	1.28	0.72-2.27	0.24
Model 5	Ref.	0.98	0.54-1.76	1.50	0.75-2.99	0.76	0.34-1.68	0.68
Incident functional limitations (n=538)	**Never overweight**	**Only current overweight**		**Overweight since age 40y**		**Overweight since age 25y**		**P-value for trend**
Incident functional limitations (%)	16.7	21.2		26.3		21.5		0.26
OR for incident functional limitations		OR	95% CI	OR	95% CI	OR	95% CI	
Model 1	Ref.	1.26	0.72-2.18	1.54	0.84-2.82	1.19	0.62-2.29	0.39
Model 2	Ref.	1.33	0.76-2.34	1.61	0.87-2.98	1.25	0.64-2.41	0.33
Model 3	Ref.	1.32	0.75-2.32	1.69	0.90-3.15	1.17	0.59-2.30	0.39
Model 4	Ref.	1.67	0.93-3.00	2.22	1.16-4.24	1.53	0.75-3.11	0.10
Model 5	Ref.	1.20	0.56-2.54	1.40	0.55-3.52	0.84	0.28-2.57	0.72

Model 1 adjusted for socio-demographic factors (sex, education) and baseline functional limitations, Model 2 additionally adjusted for lifestyle factors (smoking, physical activity), Model 3 additionally adjusted for chronic disorders (heart disease, diabetes, stroke and cancer), Model 4 additionally adjusted for grip strength, Model 5 additionally adjusted for current BMI.

Prospective analyses

Change in functional limitations as a continuous variable was not different across the overweight history groups (Table 3). However, any decline in functional status after three years of follow-up occurred more often in overweight participants and most in participants who were overweight since the age of 40 years. When adjusting for demographic and lifestyle factors, chronic diseases and grip strength (model 4), the results showed that participants who were overweight since the age of 40 years had the highest odds for any decline of functional status (OR 2.34 (1.40-3.90)). The association attenuated when current BMI was added to the model and was no longer statistically significant (model 5). Regardless of any adjustments made, participants who were only currently overweight or overweight since the age of 25 years did not have a significantly higher odds ratio for a decline of functional status as compared to the never overweight group and trends across the overweight history groups were not statistically significant. When assessing the association between overweight history and incident functional limitations, no significant trends across the overweight groups were found. Only in model 4, participants who were overweight since the age of 40 years had a higher OR (OR 2.22 (1.16-4.24) compared to the never overweight group. No interaction was found in any of the prospective associations.

Discussion

In the current study, an association between longer overweight history and more self-reported functional limitations was found in late middle-aged adults. The association could not be explained by socio-economic factors, lifestyle factors, chronic diseases or grip strength. When adding current BMI to the models, the associations disappeared. Longitudinally, there was no association between overweight history groups and change in functional limitations score or incident functional limitations. However, a significant association between overweight history and any decline of functional status after three years of follow-up was observed. Again, current BMI strongly attenuated this association.

In our study, an extensive evaluation of possible confounding and/or mediating factors was carried out in order to gain insight into possible explanations of the

association between overweight history and functional limitations. Socio-demographic and lifestyle factors and chronic diseases somewhat attenuated the association. Grip strength was shown to strengthen the association, which indicated a buffering effect against functional limitations of a higher grip strength with longer overweight history. Current BMI was shown to be a strong mediator of the association between overweight history and functional limitations. These results suggested that the higher risk for functional limitations with a longer overweight duration is a consequence of the fact that late middle-aged adults who have experienced a longer overweight duration have a higher current BMI. The mean BMIs of the overweight groups were 27.6 kg/m^2 in the only currently overweight group, in participants who were overweight since age 40 years the mean BMI was 29.8 kg/m^2, while in participants who were overweight since age 25 years the mean BMI was 31.3 kg/m^2. It is difficult to disentangle the roles of current BMI, weight change and BMI at young adult ages. Current BMI is undeniably a consequence of the other two, without a high BMI at young adult age and/or a substantial weight gain; the high current BMI would not have been reached. Negative consequences of weight gain on functional capabilities have been previously described (7, 16), but these studies focused on the magnitude of the gained weight and had no information on the timing and pace of the increase of body weight. Because of the small numbers, we could not study the association of overweight at adult ages with functional limitations at late middle age in participants who subsequently lost weight to retain a healthy weight at late middle age.

We found an interaction between overweight history and current BMI, which showed that in persons with a current BMI between 25 kg/m^2 and 30 kg/m^2, a longer overweight duration was not significantly associated with functional limitations, although the risk tended to increase. The absence of a significant association might have been caused by the smaller numbers of participants included in this analysis. In contrast, among participants with a current BMI of over 30 kg/m^2 overweight history was inversely associated with prevalent functional limitations. Obese participants who gained all their excess weight after the age of 40y and thus were only currently overweight had the highest odds for functional limitations. Participants who reported overweight since the age of 25y

had a four fold lower odds for functional limitations at late middle age than had their peers that were only currently overweight. These results suggest that a rapid increase in body weight leading to obesity might be more harmful for ones functional capabilities. A possible explanation is that the initially healthy weight participants who gained weight after the age of 40 years to become obese at late middle age, did so because of underlying co morbidities. Although the analyses were thoroughly adjusted for chronic diseases, residual confounding might still exist. Alternatively, a survival effect could also have played a role. Possibly, the late middle-aged adults in our study who were overweight since young adult age represent a group of strong survivors who are less susceptible to the negative effects of overweight on function. Finally, the finding of a protective effect of a longer overweight history in currently obese participants might reflect the hypothesis that gaining weight in different phases of life may have different consequences as has been described in literature on metabolic consequences of overweight history (17). Persons who gain weight at young (adult) age are reported to have a relatively more favourable body composition and health behaviours as compared to persons gaining weight at later age (18). The fact that both cross-sectionally and prospectively, the highest ORs were found in the participants who were overweight since the age of 40 years instead of in the participants with the longest overweight history, might support these hypotheses.

Prospectively, persons with a longer overweight duration are at increased risk for functional decline in the next three years. Possibly, persons who are susceptible for the negative consequences of obesity already are affected at late middle age, and they can be expected to decline further. No association with the new onset of functional limitations was found in participants without any limitations at baseline. Persons with a history of overweight who do not have complications yet at late middle age might be able to maintain their functioning for a couple more years. A possible explanation could be the higher grip strength of participants without functional limitations at baseline as compared to their peers with functional limitations (results not shown) in each overweight history group.

Several previous studies have been performed on the influence of weight at young-adult age and overweight history on various aspects of physical functioning at later ages. For example, Houston et al. (7) previously reported an association

between obesity at young adult age (25y) and functional disability in late middle age (45-64 years). In this study, only one assessment of body weight in the past was included (recalled body weight at age 25y) and the current weight of participants was not taken into account in the analyses. The cumulative effect of a longer duration of overweight was not addressed. Cumulative effects of a longer overweight duration on the risk for mobility limitations and worse physical performance have also been reported in previous studies (8-10). To our knowledge, no previous studies investigated the cumulative effect of overweight history on functional decline in late middle-aged or older adults.

A limitation of the current study is the use of recalled weight in (early) adulthood. It has been shown in several previous studies that recalled body weight is highly correlated with actual body weight in the past in older men and women (19, 20). Using BMI as an indicator of overweight and obesity has its limitations as well. Due to age-related changes in body-composition, the validity of the classification of overweight and obesity according to BMI in older adults has been questioned (21, 22). However, no other self-reported anthropometric measures over the course of adulthood were available. By using height and weight at age 55-65y and recalled weight at ages 25 and 40 years, the largest part of adulthood was covered. Further important strengths of the current study include the use of longitudinally collected data of a population-based sample of late middle-aged adults. Extensive data on possible confounding and/or mediating factors were also available.

In conclusion, we found a cumulative effect of overweight over the lifespan on functional limitations. The higher current BMI of late middle-aged adults with a longer overweight duration largely explained the association. With the rising prevalence of overweight and obesity over the whole lifespan, more and more future generations of older adults will have spent a large part of their lives being overweight. Our results stress the importance of preventing weight gain over the lifespan and particularly a rapid increase of body weight after age 40y resulting in obesity in late middle age. Furthermore, with current BMI playing an important role in the association of overweight history with functional limitations, it is suggested that weight loss might prevent the negative consequences of overweight on functional status. Future research should address the question

whether the negative consequences of overweight at younger ages on functioning in late middle age can potentially be reduced or eliminated by intentional weight loss later in life.

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