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Associations between long commutes and subjective health complaints among railway workers in Norway

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ABSTRACT

Commuting is an important aspect of daily life for many employees, but there is little knowledge of how this affects individual commuters' health and well-being. The authors investigated the relationship between commuting and subjective health complaints, using data from a web-based questionnaire. In a sample of 2126 railway employees, 644 (30.3%) had long commute times. A 29-item inventory was used to measure the number and degree of the subjective health complaints. Those who commuted 60 min or more each way were characterized by significantly higher numbers and degrees of subjective health complaints compared with their peers with short commutes. The mean number of complaints was 7.5 among the former group and 6.4 for the latter group ($p = 0.009$). In a regression model, in which the authors controlled for age, gender, education, self-rated health, and coping, the employees with long commutes reported more complaints than those with short commutes. Significant associations were found between those with long commutes and the number and degree of incidences of self-reported musculoskeletal pain, pseudo-neurologic complaints, and gastrointestinal problems. Commuters who had had long commutes for more than 10 years reported more gastrointestinal and musculoskeletal complaints than those with long commutes for less than 2 years. Also, commuters with long commutes spent less time with their families and leisure activities compared with those with short commutes. The authors conclude that the association between long commute times and higher levels of subjective health complaints should attract the attention of transport planners, employers, and public health policymaker.

1. Introduction

A growing number of employees have long commutes. Social and economic changes from an industrial society to a service/knowledge society and general improvements in transport systems have made commuting an important part of modern life in Norway and other Western societies (Engebretsen et al., 2012; Green et al., 1999; Sandow & Westin 2010). There have been important changes in working life and family life due to more non-manual occupations, more women in employment, and more flexible working practices (Green et al., 1999). One negative implication is increased time spent on traveling, which makes people less physically active (Lindstrøm, 2008). Long commutes can also contribute to stress experiences and sleep problems for workers (Hansson et al., 2011). However, there has been little research conducted on the possible health effects of long commutes in Norway.

For many people, commuting is a mental and physical burden, which can result in health complaints. Commuters have reported lower subjective well-being, that commuting was time-consuming, that it made family life harder; and that traveling time increased their stress levels (Stutzer & Frey, 2008). Long commutes are more common among men (Lyons & Chatterjee, 2008). Both men and women with long commutes have reported poor mental health and psychological distress (Feng & Boyle, 2014; Hansson et al., 2011). Disorders such as high blood pressure, overweight, low energy levels, and reduced physical and mental health have been related to long-distance commuting (Hansson et al., 2011, Hoehner et al., 2012).

Subjective health complaints (SHC) are complaints without objective pathological signs (Eriksen et al., 1999). Such complaints are common everyday symptoms, but for some individuals they reach a level of discomfort that can lead to sickness absence (Ihlebæk & Eriksen, 2003). Women have reported SHC more frequently and to a greater extent than men, and the intensity of most of their complaints increases with age (Ihlebæk et al., 2002).

Previous studies have focused on long commuting times and mental health problems, stress, and physical health complaints. To our knowledge, no studies to date have investigated the associations between long commutes and subjective health complaints. Better awareness and information about the burdens of long commutes are important for health promotion and preventative actions in public health.

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The aim of the study was to investigate the prevalence of SHC in a Norwegian working population and the associations between long commuting times and SHC. We also aimed to explore whether the number of years with long commutes affected the prevalence of SHC.

2. Methods

2.1. Study population

In March 2015, we invited all 7307 members of the Norwegian Train Drivers Union (Norsk Lokomotivmannsforbund) and the Norwegian Union of Railway Workers (Norsk Jernbaneforbund) to participate in the study. Representatives of all professions in these unions were included in the study, such as conductors, bus drivers, office workers, train drivers, and other railway workers. After 93 individuals with invalid e-mail addresses were excluded, invitations were sent to 7214 workers. Of these, 2215 individuals participated in the study (response rate 30.8%). A total of 89 individuals were removed due to missing values and the final size of the target population was 2126. The questionnaire was given in Norwegian only.

2.2. The questionnaire

The online questionnaire, produced by Survey Monkey (SurveyMonkey Inc.), included a broad range of demographic variables such as gender, age, family situation, and education; travel variables such as commuting time to the working place, number of years commuting, and traveling method; and variables related to health such as self-rated health, subjective health complaints, complaints related to commuting, and individual coping resources.

We categorized age into six groups: below 20 years, 21–30 years, 31–40 years, 41–50 years, 51–60 years, and above 60 years. The participants' family situation was categorized into four different groups: living alone, living together with cohabitant/partner, living together with persons above 18 years, and living together with persons below 18 years. Education was categorized into five groups: elementary school, vocational education, secondary school, college/university for less than or equal to 4 years, and college/university for >4 years. The variable was recoded into a three-category variable with the following categories: primary, secondary, or tertiary education. We asked about commuting time in the question: "How long time does it take to get to work (single journey)?" The question had two levels: below 60 min (short commute) or 60 min or more (long commute). Participants who answered 60 min or more also reported the number of years they had had long commutes: <2 years, 2–5 years, 6–10 years, or 11 years or more. We categorized the traveling modes into 10 different groups: walking, train, bus, underground, car, bicycle, moped/motorcycle, tram, boat, or other transport. The traveling methods were grouped into two variables. Participants who used at least one active mode of transport (walking, bicycle, and moped/motorcycle) were categorized as active travelers, and participants who used at least one mode of public transport were categorized as public travelers (train, bus, underground, tram, or boat).

Self-rated health was measured by a single question: "How is your health right now?" The participants were given four response options: very poor, poor, good, and very good. These were recoded into a two-category variable with the following levels: good and not good. The research question has been used in different health surveys (Næss et al., 2008). Participants were also asked if their health complaints could possibly be related to commuting. Individual coping was measured by the question: "Do you feel that you are coping with your day-to-day challenges?" The question required a yes or no response. The participants were also asked whether they were spending enough time with their family or on leisure activities. We considered a commuting time of 60 min or more as the exposure variable.

2.3. Subjective health complaints (SHC) inventory

In this study, we used Eriksen et al.'s subjective health complaints inventory (Eriksen et al., 1999) to measure health complaints experienced during the last 30 days. The questionnaire has been validated and has satisfactory validity and reliability (Eriksen et al., 1999). The inventory consists of 29 items, for which the severity of each complaint is scored on a four-point scale ranging from "no complaints" (0) to "severe complaints" (3). Five subscales are usually reported: *musculoskeletal pain* (headache, migraine, neck pain, lower back pain, upper back pain, arm pain, shoulder pain, and leg pain); *pseudo-neurology* (palpitation, heat flushes, sleeping problems, tiredness, dizziness, anxiety, depression); *gastrointestinal problems* (heartburn, stomach discomfort, ulcer and non-ulcer dyspepsia, stomach pain, bloating, diarrhea, and constipation); *allergy* (asthma, breathing difficulties, eczema, allergies, and chest pain); and *flu* (cough and flu) (Eriksen et al., 1999).

We summed the health complaints in two different ways. First, we counted the number of complaints, but did not differ between degrees of complaints. The total range of this variable was 0–29. The second variable was the degree of complaints (four-point scale of complaints), in which we included the severity reported. The range was 0–87. We also computed the number of complaints and degree of complaints for the five subscales.

2.4. Statistical analysis

Descriptive statistics were used to summarize the different variables in the study. We applied Chi-square tests to study the associations between categorical variables. To test whether continuous variables, such as degree of complaints, were distributed differently between the two commuting groups, we performed t-tests.

To adjust for potentially confounding variables, we used linear regression models to model subjective health complaints as a function of commuting, age, gender, education, self-rated health, and coping. The main outcome of the regression analysis was an expected difference in health complaints between participants with long and short commutes, adjusted for the confounding variables and with associated 95% confidence intervals. In separate models, we included travel modes as confounders, and in these models we reported the adjusted effects of subjective health complaints relating to commuting and travel modes.

Among the participants who commuted 60 min or more, we investigated whether the number of years they had commuted was associated with subjective health complaints. The outcome of these analyses was the expected difference in complaints for the different levels of commuting history compared with the reference category (less than two years).

P-values <0.05 were considered statistically significant. We used the free software R Version 3.2.5 (www.r-project.com).

2.5. Ethics

The questionnaire was answered anonymously and therefore approval from the Regional Ethical Committee was not necessary.

3. Results

3.1. Descriptive findings

Table 1 lists details of the target population (N = 2126). A total of 644 individuals (30.3%) had long commutes and 1482 (69.7%) had short commutes. There were 469 (22.1%) women and 1657 (77.9%) men in the sample, and their mean age was 45.5 years. In all, 25.2% had tertiary education qualifications, 68.2% had secondary level, and 6.6% had primary level.

The typical participant in the study was a male aged >50 years, who was living with someone and had secondary education qualifications.

Table 1
Descriptive characteristics of target population (N = 2126). We show figures for long commuters and short commuters. *P*-values are results from chi-square tests.

Characteristics	Long commuters	Short commuters	All	*p*-value
All	644 (30.3%)	1482 (69.7%)	2126 (100%)	
Gender				
Women	136 (21.1%)	333 (22.5%)	469 (22.1%)	0.526
Men	508 (78.9%)	1149 (77.5%)	1657 (77.9%)	
Age				
<30 years	87 (13.5%)	217 (14.6%)	304 (14.3%)	0.569
31–40 years	96 (14.9%)	249 (16.8%)	345 (16.2%)	
41–50 years	160 (24.8%)	357 (24.1%)	517 (24.3%)	
>50 years	301 (46.7%)	659 (44.5%)	960 (45.2%)	
Education				
Primary	48 (7.5%)	93 (6.3%)	141 (6.6%)	0.522
Secondary	440 (68.3%)	1009 (68.1%)	1449 (68.2%)	
Tertiary	156 (24.2%)	380 (25.6%)	536 (25.2%)	
Family situation				
Living with someone	525 (81.5%)	1182 (79.8%)	1707 (80.3%)	0.379
Living alone	119 (18.5%)	300 (20.2%)	419 (19.7%)	
Complaints related to commuting				
Yes	114 (17.7%)	48 (3.2%)	162 (7.6%)	<0.001
No	353 (54.8%)	1259 (85%)	1612 (75.8%)	
Nor sure	177 (27.5%)	175 (11.8%)	352 (16.6%)	
Individual coping				
Yes	610 (94.7%)	1409 (95.1%)	2019 (95%)	0.814
No Not sure	34 (5.3%)	73 (4.9%)	107 (5%)	
Enough time together with family				
Fits well	83 (12.9%)	354 (23.9%)	437 (20.6%)	<0.001
Fits quite well	250 (38.8%)	680 (45.9%)	930 (43.7%)	
Fits a little bit	220 (34.2%)	307 (20.7%)	527 (24.8%)	
Does not fir at all	59 (9.2%)	67 (4.5%)	126 (5.9%)	
Cannot answer	32 (5%)	74 (5%)	106 (5%)	
Enough time to leisure activities				
Fits well	58 (9%)	245 (16.5%)	303 (14.3%)	<0.001
Fits quite well	190 (29.5%)	543 (36.6%)	733 (34.5%)	
Fits a little bit	263 (40.8%)	513 (34.6%)	776 (36.5%)	
Does not fir at all	131 (20.3%)	169 (11.4%)	300 (14.1%)	
Cannot answer	2 (0.3%)	12 (0.8%)	14 (0.7%)	
Self-related health				
Good health	154 (23.9%)	270 (18.2%)	424 (19.9%)	0.003
Not good health	490 (76.1%)	1212 (81.8%)	1702 (80.1%)	
Mode of transportation – public				
Not public	98 (15.2%)	779 (52.6%)	877 (41.3%)	<0.001
Public	546 (84.8%)	703 (47.4%)	1249 (58.7%)	
Mode of transportation – active				
Not active	498 (77.3%)	938 (63.3%)	1436 (67.5%)	<0.001
Active	146 (22.7%)	544 (36.7%)	690 (32.5%)	

There were no significant differences between commuters with long and short commutes in terms of their age, gender, education, family situation, and individual coping skills (Table 1). We found significant differences in the prevalence of poor health status, the time participants spent with their families, and self-rated health related to commuting. We also found that those with long commutes used public transportation more frequently than those with short commutes (respectively 84.8% and 47.4%, $p < 0.001$) and that the former used active transportation significantly less often than the latter (respectively 22.7% and 36.7%, $p < 0.001$).

3.2. Commuting and health outcomes

Table 2 lists the number of complaints and degree of complaints for both commuters with long commuting times and short commuting times. The prevalence of subjective health complaints was higher in the former group, both with regard to the number of health complaints and the degree of complaints. We found higher scores among those with long commutes than those with short commutes for all subscales and the sum of the 29 complaints. The mean number of complaints was 7.5 (SD = 8.3) among the participants with long commutes and 6.4 (SD = 9.2) among those with short commutes ($p = 0.009$). The former reported more musculoskeletal and gastrointestinal complaints ($p = 0.002$ and $p = 0.001$) than those in the latter group.

The degree of complaints was higher in the group of participants with long commutes compared with those with short commutes; the mean degree of complaints was respectively 10.7 (SD = 5.1) and 8.8 (SD = 5.5) ($p < 0.001$). Participants with long commutes reported

Table 2
Mean subjective health complaints for all participants and for long and short commuters, including standard deviations (SD). The last column shows *p*-values resulting from independent sample t-tests. The upper half of the table shows number of complaints and the lower half shows the degrees of complaints. Significant *p*-values in bold.

	All	Long commuters	Short commuters	*p*-value
Number of complaints				
Musculoskeletal	2.5 (2.2)	2.7 (2.2)	2.3 (2.3)	**0.002**
Pseudo neurology	1.8 (1.7)	2.0 (1.6)	1.6 (1.8)	0.309
Gastrointestinal	1.4 (1.6)	1.5 (1.6)	1.2 (1.7)	**0.001**
Allergy	0.6 (0.9)	0.6 (0.9)	0.5 (0.9)	0.164
Flu	0.6 (0.8)	0.6 (0.8)	0.6 (0.8)	0.630
All complaints	7.0 (8.6)	7.5 (8.2)	6.4 (9.2)	**0.009**
Degree of complaints				
Musculoskeletal	3.8 (3.9)	4.2 (3.7)	3.4 (4.2)	<**0.001**
Pseudo neurology	2.5 (2.8)	2.8 (2.6)	2.2 (3.0)	<**0.001**
Gastrointestinal	1.9 (2.5)	2.1 (2.4)	1.7 (2.7)	**0.003**
Allergy	0.8 (1.3)	0.8 (1.3)	0.7 (1.3)	0.476
Flu	0.9 (1.3)	0.9 (1.3)	0.9 (1.3)	0.738
All complaints	9.8 (5.2)	10.7 (5.1)	8.8 (5.5)	<**0.001**

more musculoskeletal pain ($p < 0.001$), pseudo-neurologic complaints ($p < 0.001$), and gastrointestinal problems ($p = 0.003$) than those with short commutes. We found no difference between the groups in allergy and flu complaints.

Table 3 shows the results of the regression analysis, in which we included the confounding variables. We found statistically significant differences in musculoskeletal pain, pseudo-neurologic complaints, and gastrointestinal problems (model 1). As an example, for participants who commuted 60 min or more there was a difference of 0.56 in reported musculoskeletal complaints (95% CI: 0.24–0.87) compared with those who commuted <60 min. In the next column in Table 3, we included active traveling methods (model 2). We observed small differences in the expected differences in health complaints except for gastrointestinal problems, which were no longer statistically significant and for which active/passive traveling modes confounded the association between commuting and health complaints. Active transportation was also an independent contributor to both the number and degree of complaints; it was associated with a reduction in the number of musculoskeletal complaints (−0.41, 95% CI: −0.73 to −0.009) and an increase in the number of pseudo-neurological complaints (0.42, 95% CI: 0.2–0.64) and gastrointestinal complaints (0.29, 95% CI: 0.07–0.51). Similar results were observed for the degree of complaints. Public transportation as opposed to private transportation (model 3) was not a confounder for the number and degree of health complaints.

In Table 4, we list the results of the investigation into the number of years spent commuting and the SHC among participants with long commutes (n = 644). We found that those who had commuted 60 min or more for 11 years or more reported 1.0 (95% CI: 0.03–1.97) more musculoskeletal complaints than those who had commuted 60 min or more for less than two years. We found similar results for gastrointestinal complaints. However, for this subscale, significant differences were observed for both the number and degree of complaints and for participants who had commuted for 2–5 years compared with participants who had commuted <2 years.

Table 4
Association between commuting history (reported as numbers of years the participants have long commuted) and subjective health complaints, adjusted for gender, age, education, coping, and self-rated health status (n = 644. We show significant result in bold.

		Number of complaints	Degree of complaints
	Commuting history	B (95% CI)	B (95% CI)
Musculoskeletal	<2 years	0 (ref)	0 (ref)
	2–5 years	0.88 (−0.13–1.88)	0.30 (−0.28–0.87)
	6–10 years	0.79 (−0.27–1.86)	0.25 (−0.36–0.85)
	>10 years	**1.00 (0.03–1.97)**	0.36 (−0.20–0.91)
Pseudo neurology	<2 years	0 (ref)	0 (ref)
	2–5 years	−0.31 (−1.00–0.38)	−0.16 (−0.58–0.26)
	6–10 years	0.09 (−0.65–0.82)	0.01 (−0.44–0.45)
	>10 years	−0.02 (−0.69–0.65)	−0.04 (−0.45–0.36)
Gastrointestinal	<2 years	0 (ref)	0 (ref)
	2–5 years	**0.84 (0.14–1.54)**	**0.53 (0.09–0.98)**
	6–10 years	0.56 (−0.19–1.3)	0.33 (−0.14–0.81)
	>10 years	**0.73 (0.05–1.41)**	**0.44 (0.01–0.87)**
Allergy	<2 years	0 (ref)	0 (ref)
	2–5 years	0.28 (−0.06–0.61)	0.11 (−0.12–0.35)
	6–10 years	0.10 (−0.25–0.46)	0.00 (−0.25–0.25)
	>10 years	0.21 (−0.11–0.53)	0.11 (−0.12–0.34)
Flu	<2 years	0 (ref)	0 (ref)
	2–5 years	−0.18 (−0.53–0.16)	−0.09 (−0.3–0.11)
	6–10 years	−0.10 (−0.47–0.27)	−0.07 (−0.29–0.16)
	>10 years	−0.18 (−0.51–0.16)	−0.10 (−0.3–0.10)
All complaints	<2 years	0 (ref)	0 (ref)
	2–5 years	0.69 (−0.59–1.97)	1.50 (−0.59–3.60)
	6–10 years	0.52 (−0.84–1.88)	1.44 (−0.78–3.66)
	>10 years	0.76 (−0.48–2.01)	1.74 (−0.29–3.77)

4. Discussion

We found that long commuting times were associated with more subjective health complaints than short commuting times. Long commutes were associated with increased numbers and degrees of musculoskeletal, pseudo-neurological, and gastrointestinal complaints. When adjusted for confounding variables, the associations between commuting and SHC were stronger. Active transportation, but not public transportation, confounded the association between commuting and health complaints. We also found that long commuting times were associated with less time spent with the family and on leisure activities compared with short commuting times. Finally, we found that participants with long commutes and a long commuting history reported

Table 3
Results from linear regression analysis. The table shows the expected change in subjective health complaints for long commuters compared to short commuters adjusted for age, gender, education, coping, and self-rated health (model 1). In model 2 we also adjusted for active/passive transportation and in model 3 for public/not-public transportation. Significant *p*-values in bold.

Number of complaints		Model 1	Model 2	Model 3
Musculoskeletal	Commuting	**0.56 (0.24–0.87)**	**0.71 (0.37–1.05)**	**0.55 (0.23–0.87)**
	Transport		**−0.41 (−0.73 to −0.09)**	−0.06 (−0.37–0.26)
Pseudo neurology	Commuting	**0.49 (0.28–0.71)**	**0.34 (0.10–0.57)**	**0.5 (0.28–0.72)**
	Transport		**0.42 (0.2–0.64)**	0.03 (−0.19–0.24)
Gastrointestinal	Commuting	**0.33 (0.11–0.54)**	0.22 (−0.02–0.45)	**0.32 (0.1–0.54)**
	Transport		**0.29 (0.07–0.51)**	−0.02 (−0.23–0.2)
Allergy	Commuting	0.02 (−0.10–0.13)	−0.03 (−0.15–0.09)	0.02 (−0.09–0.14)
	Transport		0.12 (0.00–0.23)	0.05 (−0.06–0.17)
Flu	Commuting	0.0 (−0.12–0.11)	−0.04 (−0.16–0.08)	−0.01 (−0.12–0.11)
	Transport		0.09 (−0.02–0.21)	−0.02 (−0.13–0.1)
All complaints	Commuting	**0.83 (0.41–1.26)**	**0.69 (0.24–1.14)**	**0.83 (0.41–1.26)**
	Transport		0.37 (−0.05–0.8)	−0.01 (−0.43–0.41)
Degree of complaints				
Musculoskeletal	Commuting	**0.28 (0.10–0.47)**	**0.36 (0.16–0.56)**	**0.28 (0.09–0.47)**
	Transport		**−0.2 (−0.38 to −0.01)**	−0.02 (−0.2–0.17)
Pseudo neurology	Commuting	**0.3 (0.17–0.44)**	**0.22 (0.07–0.37)**	**0.31 (0.17–0.44)**
	Transport		**0.22 (0.08–0.36)**	0.02 (−0.12–0.15)
Gastrointestinal	Commuting	**0.22 (0.08–0.36)**	0.15 (0.00–0.31)	**0.22 (0.07–0.36)**
	Transport		**0.17 (0.03–0.32)**	−0.02 (−0.17–0.12)
Allergy	Commuting	0.03 (−0.05–0.11)	−0.01 (−0.08–0.1)	0.03 (−0.05–0.11)
	Transport		**0.1 (0.02–0.18)**	0.05 (−0.03–0.13)
Flu	Commuting	0.0 (−0.07–0.07)	−0.03 (−0.10–0.05)	0.0 (−0.07–0.07)
	Transport		0.07 (0–0.14)	−0.04 (−0.11–0.03)
All complaints	Commuting	**1.39 (0.72–2.06)**	**1.19 (0.47–1.91)**	**1.39 (0.71–2.06)**
	Transport		0.51 (−0.17–1.19)	−0.01 (−0.68–0.66)

more complaints than those with long commutes and a short commuting history.

We are not aware of any other studies that have investigated the associations between subjective health complaints and commuting. Künn-Nelen investigated the association between commuting time and subjective health, and she found that commuting time significantly reduced both health satisfaction and health status (Künn-Nelen, 2016). Also, some studies have revealed associations between long commuting times and poor sleep quality, exhaustion, and stress (Hansson et al., 2011; Kluger, 1998). Stutzer and Frey (2008) reported that longer commuting times to work systematically decreased the commuters' life satisfaction.

We observed that participants with long commutes reported worse self-rated health compared with those with short commutes. This could have severe public health consequences since self-rated health is strongly linked to both morbidity and mortality (Heistaro et al., 2001; Holseter et al., 2015).

Kluger (1998) observed that commuting by car was positively correlated with high blood pressure, negative mood in the evening hours after work, self-reported tension, tiredness, lower back pain, and neck pain. Similar results were found among rail commuters (Evans & Wener, 2006). Parallel to our study, Gottholmseder et al., (2009) found differences between active and passive modes of commuting: workers who cycled or walked to work reported lower stress levels compared with those who commuted by train, bus, or car. Olsson et al., (2013) found similar results in their study: slow commute modes (walking and cycling) resulted in more satisfaction than commuting by car and public transport. However, our results were conflicting with respect to how active transportation affected subjective health complaints: we observed that active transportation was associated with reduced musculoskeletal complaints, but with increased pseudo-neurological and gastrointestinal complaints.

The associations between commuting and SHC can most likely be explained by treating commuting as a stressor. According to cognitive activation theory of stress (CATS), a stress experience always leads to a stress response, which is a normal, healthy, and necessary alarm (Ursin & Eriksen, 2004). The level and length of the alarm depend on the expectancy of outcome of the stress experience and on individual coping resources. In the CATS model, coping is defined as a positive response consequence. This means that the individual expects to handle the situation with a positive result. However, if the stress is continuous, there may be a risk of health complaints, illness, and disease (Ursin & Eriksen, 2004). Many of the impacts of commuting are subjective in nature and difficult to measure. For some individuals, traveling can provide time out from other daily tasks, and they can use the trip for relaxation, sleeping, or reading. Moreover, some people have the ability to perceive the positive sides of commuting and tolerate long commuting times better than others (Lyons & Chatterjee, 2008).

The main determinants of stress induced by commuting are delays caused by traffic jams, the driving behavior of others in traffic, and the unreliability of public transport services. Commuting is more stressful when there is less control over factors such as traffic, time pressure, or the environment within the vehicle (Lyons & Chatterjee, 2008). Gottholmseder et al., (2009) reported that commuting plays a central role in explaining stress among workers.

In our study, we found weak relationships between the number of years spent commuting and SHC. Those who had commuted >10 years reported more SHC relating to musculoskeletal and gastrointestinal problems than those who had commuted <2 years. Sposato et al., (2012) found that commuting stress seemed to diminish with increasing years of commuting.

4.1. Strengths and limitations

Our study was the first of its kind in Norway. To our knowledge, no studies have investigated associations between long commuting times and subjective health complaints. In our study, we used a validated SHC questionnaire and the number of participants was large.

The study had some limitations. The cross-sectional study design made it impossible to draw conclusions about the causal relationships between long commutes and subjective health complaints. Even though the results of several previous studies imply that long commutes cause health problems, the converse may be the case. Individuals with health complaints may search for explanations and attribute their complaints to long commutes. However, our cross-sectional study should be regarded as an exploratory study of the association between long commutes and subjective health complaints.

We included important potential confounding factors in the analyses. Nevertheless, the association between long commutes and subjective health complaints could possibly be confounded by variables that were not included in our study. One such variable is job satisfaction. The prevalence of subjective health complaints is higher in groups of employees who report high workload and low levels of coping (Eriksen & Ursin, 1999). According to Eriksen and Ursin (1999), individuals who felt that they coped had reported fewer health problems than individuals who did not cope, even when they had high job demands. These occupational factors can explain some of the variance in subjective health complaints. Individual factors such as psychological demands, perceived job stress, and other psychological factors may also confound the relationship between commuting and health complaints. The lack of information about job conditions and job satisfaction may have had an impact on the results of our study. The health effects of shift work are also well known (Knutsson, 2003), and may confound the relationship between long commuting and subjective health complaints.

The response rate in our study was modest (30.8%) and this makes it difficult to evaluate the representativeness of the sample. The two unions' e-mail registries were not up to date, and could have contained addresses of previous members as well as current members. It is therefore likely that the response rate was higher than 30.8%.

There is a risk that the participants' answers were affected by their moods, attitudes, or lack of time. Another source of bias could be that non-responders either did not receive our e-mails or were not able to read them. Some of them may have thought that commuting was not an actual phenomenon for them. If so, it is likely that individuals who had long commutes were more likely to respond to the questionnaire than others.

Lindsted et al., (1996) reported that studies such as ours are characterized by “healthy volunteer” effects, because the respondents tend to have better health than non-respondents (Rothman, 2012, page 127). It is possible that railway workers are healthier and experience commuting as less stressful than other workers. This may have resulted in an underestimation of the prevalence of subjective health complaints among the participants in our study.

We cannot rule out possible information biases. There is always a risk that persons perceive the questions differently. There will also be differences in participants' decisions regarding which health symptoms ought to be reported. Hopefully, the choice of a validated questionnaire limited this problem. Information bias could have occurred through potential over-reporting or underreporting due to self-reported data on subjective health. Questions regarding coping, complaints related to commuting, and travel details have not been validated and could therefore be associated with information bias. Finally, cross-sectional studies in which the same individuals report both exposure (commuting) and outcome (subjective health complaints) are associated to common-method variance, which could bias the results (Lindell & Whitney, 2001).

5. Conclusions

Long commutes take up a considerable amount of time in an employee's day. The results of our cross-sectional study provide evidence

that long commutes are associated with health complaints among railway workers in Norway. The negative health effects of long commutes must be included in future discussions on the increasing mobility of employees. There are both social and health benefits to be gained from improving the travel experiences of workers with long commutes. Greater flexibility in working hours might relieve some stress caused by commuting. Further research is needed to examine how long commutes lead to health complaints and which groups of workers are more vulnerable to the negative effects of long commutes.

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