

A systematic literature review of the relationship between work hours and sickness absence

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REVIEW ARTICLE



A systematic literature review of the relationship between work hours and sickness absence

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ABSTRACT

The aim of this study was to determine the relationship between work hours and sickness absence: is a higher number of work hours associated with better or with adverse health? A systematic literature review was performed by searching Medline, PsychInfo, and Web of Science. All abstracts were screened to identify papers that empirically investigated the relationship between work hours and sickness absence in a working population. A total of 1072 papers were identified, and 70 papers were included in this review. A simple measure of the strength of effects was applied, and the findings are summarised in narrative form. Evidence supporting a relationship between sickness absence and working part-time or work hours as a continuous variable was inconclusive. These inconclusive findings might be due to heterogeneity in the operationalisation of key variables or to publication bias. Support for a negative relationship between long work hours and sickness absence was moderately strong. Possible explanations for this include the healthy worker selection effect, differences in job characteristics, and differences in job motivation. Empirical testing of these explanations, however, has been limited. Our findings indicate that employers should monitor employee health in times of high work pressure, even if sickness absence is low.

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KEYWORDS

Work hours; sickness absence; part-time work; literature review

The relationship between the number of hours spent working in a week (work hours) and overall health has been the focus of numerous studies in recent years. Several studies have found that longer work hours are associated with a wide range of adverse health outcomes, such as diabetes, depression and anxiety, mortality risk, and coronary heart disease (Holttermann et al., 2010; Kivimäki et al., 2015; O'Reilly & Rosato, 2013; Van der Hulst, 2003; Virtanen et al., 2011). Because sickness absence is closely related to health (Kivimäki et al., 2003), it stands to reason that longer work hours might also correlate with sickness absence. However, sickness absence is a complex multi-factorial issue involving many factors other than overall health. There is no general agreement in the current literature on the relationship between work hours and sickness absence and its potential underlying mechanisms. This is despite a large number of studies investigating the relationship. The purpose of this review is to systematically review empirical papers investigating the

relationship between work hours and sickness absence and to discuss their findings in light of causal explanations given in the current literature.

It is important to understand the relationship between work hours and sickness absence and its underlying mechanism(s). Sickness absence comes at a substantial cost to organisations, society, and individual employees. In many organisations, sickness absence is the primary source of information on the health of their employees. Knowing the conditions under which sickness absence does not increase when health is impaired would be very useful in these organisations to avoid creating a false sense of security regarding employee health. This relationship may also have important policy implications. Lower sickness absence among part-time employees may argue for part-time contracts. However, if part-time employees bear the burden of their illness during their non-working hours, it might highlight an inequality of involuntary part-time employment. Finally, several studies on sickness absence include work hours as a control variable (Aagestad, Tyssen, & Sterud, 2016; Bernstrøm, 2013; Böckerman & Laukkanen, 2010a), sometimes without showing or commenting on the relationship between the two. Not knowing how or why work hours influence sickness absence can obscure study results.

Mechanisms underlying the relationship between work hours and sickness absence

Several theories attempt to explain the causes of sickness absence. de Rijk (2013) presented a taxonomy of sickness absence theories and showed that these theories generally explain the causes of sickness absence in terms of health, personality traits, and/or decision-making processes. Decision-making theories assume that a decision-making process occurs and that sickness absence is not necessarily involuntary. Based only on health, we could argue that work hours affect employee health, which, in turn, affects sickness absence. The most common alternative explanations for the relationship between work hours and sickness absence includes the healthy worker effect, attendance motivation, the income-leisure trade-off model, time for restitution, opportunities for sickness absence, and differences in job characteristics. These explanations include both health and decisional aspects of sickness absence as well as reverse causality. Furthermore, these explanations highlight work hours and sickness absence as two interdependent attendance behaviours. Each of these explanations will be discussed in detail below.

Several papers have presented *the healthy worker effect*, in which there is a negative relationship between hours worked and sickness absence due to reverse causality; a healthier employee works more hours (Krantz & Lundberg, 2006; Laaksonen, Pitkaniemi, Rahkonen, & Lahelma, 2010; Niedhammer, Chastang, Sultan-Taieb, Vermeylen, & Parent-Thirion, 2013). Healthy workers might choose to work longer hours, while employees with health impairments instead choose to work fewer hours or struggle to secure full-time employment. In this case, healthy employees will, on average, work more hours than non-healthy employees, with health causing the number of hours worked, rather than the reverse.

According to the *attendance motivation* argument, the same factors that motivate employees to work longer hours also motivate them to avoid taking sickness absence. Arguably, employees who work longer hours are more motivated to attend work (e.g. they are particularly committed to their work, are more pressured to attend, or are

more difficult to replace), and they therefore work during an illness and are only absent when absolutely necessary (Ala-Mursula et al., 2006; Lesuffleur, Chastang, Sandret, & Niedhammer, 2014). Following this rationale, work hours and sickness absence are not causally related but rather are a spurious relationship influenced by a third variable (i.e. motivation). This argument is supported by evidence that longer work hours and overtime correlate with a higher degree of presenteeism, that is employees attending work while ill (Böckerman & Laukkanen, 2010b; Hansen & Andersen, 2008). Ala-Mursula et al. (2006) argued that this is why they found that longer work hours correlated with shorter (<4 days), rather than longer, periods of sickness absence. Ala-Mursula et al. (2006) stated that motivation has a weaker influence on longer periods of sickness absence, for which unavoidable causes are more likely. Indeed, short-term absence, to a greater extent than long-term absence, has been shown to correlate with causes other than health, such as job satisfaction (Marmot, Feeney, Shipley, North, & Syme, 1995).

In contrast to the attendance motivation argument and the healthy worker effect, the *income-leisure trade-off model* (Allen, 1981) predicts a positive association between work hours and sickness absence. Arguably, the more hours an employee works (and therefore the fewer non-work hours they have), the higher value the employee places on additional non-work time (Chaudhury & Ng, 1992; Lokke, 2014). In other words, an employee with plenty of spare time will not appreciate an additional hour or day off from work as much as an employee with very limited spare time. For employees who work many hours, leisure time is valuable, and they are more motivated to call in sick than others who work fewer hours.

The attendance motivation and income-leisure trade-off models highlight the decisional aspect of sickness absence. Importantly, decisional theories do not necessarily imply that employees call in sick without being ill. In many cases, reduced health (e.g. the flu, back pain, and depression) might reduce an individual's ability to go to work, without precluding him or her from attending (Johansson & Lundberg, 2004). The employee then makes a decision of whether to attend based on their ability and motivation (Steers & Rhodes, 1978).

Differences in job characteristics might be an important confounder in the relationship between work hours and sickness absence. In particular, the job characteristics of employees who work long hours might differ from those of the general population. Krantz and Lundberg (2006) found that employees who work longer hours are more likely to hold top-level positions. The number of hours employees work may also influence the workplace. Sanders and Nauta (2004) argued that the number of hours employees work as part of a team influences team cohesiveness. The more the employees work, the more the time they have to interact in informal meetings and build or maintain their relationships, which decreases the likelihood that they will take shorter absences. Their study found a significant negative relationship between part-time work and cohesiveness and between cohesiveness and short-term absence. Different job characteristics might influence sickness absence both through health (e.g. some jobs are more demanding or provide employees with more resources to cope) and decisional factors (e.g. differences in job satisfaction or team engagement).

A positive relationship between work hours and sickness absence can be explained by differences in *recuperation time*. Employees with fewer work hours have more time to restore their health and therefore have less need to take sickness absence (Lokke, 2014).

More recuperation time might keep employees in better health but also increases the probability of being homesick “on their own time.” A partially overlapping explanation is the *opportunity for sickness absence*. It has been suggested that part-time employees are absent for fewer days because they have fewer available days to be absent (Burke & Greenglass, 2000).

Each of these explanations has different practical implications. This paper will discuss empirical findings and possible explanations. The three primary explanatory and/or confounding variables in the different theories are health, job characteristics, and motivation. Therefore, we will also look closely at how these variables were included in past studies.

Method

Search strategy and selection criteria

We conducted a systematic search of literature available on Medline, PsychInfo, and Web of Science. After an initial search, the search strategy was amended to include relevant papers from personal libraries. The search was conducted on 6 May 2016 and updated on 17 February 2017. The final search words used were as follows: (“working time” or “hours worked” or “overtime” or “part-time” or “work* hours”) and (“sickness absence” or “sick leave” or “absenteeism”). We used the MeSH terms “sick leave” and “absenteeism” in Medline and “Employee Absenteeism” was included as a thesaurus subject heading for PsychInfo. We also screened the reference lists of the included papers to identify additional relevant papers.

Each title and abstract was independently reviewed by both authors based on the selection criteria. In cases of uncertainty or disagreement, at least one of the authors also inspected the complete paper. We included studies that met the following criteria: the study statistically analysed the relationship between work hours and sickness absence and showed the results, the study population consisted of employed individuals, and the study was published in English, Norwegian, or Dutch language in a peer-reviewed journal.

Operationalisation of work hours and sickness absence

Operationalisation of work hours. We define work hours as the number of hours spent working during a week or more and not the actual hours spent working (e.g. night work), shift arrangement, or a combination of these variables. The results may not be the same for all categories of work hour operationalisation. For example, part-time work is likely to be specified in a work contract, while working overtime is often not. In our review, we categorised studies according to the operationalisation of work hours. The results are presented separately for the different categories of work hour operationalisation.

Operationalisation of sickness absence. We define sickness absence as absence from work due to ill health. We included all-cause sickness absence (i.e. measures of sickness absence that do not discriminate between different diagnosis), cause-specific sickness absence (e.g. sickness absence due to mental disorders), and return to work after sickness absence. Furthermore, because national rules regarding sickness absence (e.g. rules

regarding compensation and need for a medical certificate) are likely to affect the extent to which absence is categorised as sickness absence, we also included absence measures that combine sickness absence and truancy.

After careful consideration, we also included papers in which sickness absence was operationalised as follows: claims for sickness, accident, and disability insurance, which employees could make from the fourth day of their absence (Landsbergis et al., 2013); claims for injuries resulting in at least one day lost from work (Alamgir, Ngan, Drebit, Li, & Keen, 2011); work disability absence, defined as any absence for one week or more due to work-related illness or disability (Breslin et al., 2007, 2008); more than two days of work missed due to work-related injury or illness (de Castro et al., 2010); and lost-time injury claims defined as short-term disability claims for which payment is made for lost income and the employee is expected to return to work (O'Brien-Pallas et al., 2004).

Like work hours, operationalisation of sickness absence may also have an important influence on the results. Causes of absence vary depending on the length of absence, with shorter absences being more commonly attributed to causes other than illness (Marmot et al., 1995). We therefore differentiate between the duration of sickness absence (e.g. number of days in a year or in a spell) and the frequency of sickness absences (e.g. number of spells in a year). The frequency of spells is further differentiated by whether they include spells of all lengths, short spells (1–3 days), or medium/long spells (>3 days). Finally, we specify when the absence measure is conditioned on having at least one day of absence.

Data analysis

Quality assessment. No studies were excluded based on quality assessment or risk of bias. We considered the quality of the studies in two ways. First, as recommended by Glasziou, Irwig, Bain, and Colditz (2001), we categorised studies based on specific quality features to determine if results vary between groups. We report results from studies that meet a specific quality criterion (e.g. longitudinal design) separately from those that do not (e.g. cross-sectional design). Second, we assessed each quality feature across different studies and comment on strengths and limitations of the collective evidence (e.g. are the findings generally based on representative samples).

We focus on the following quality criteria: (i) measuring work hours and/or sickness absence using objective records is considered positive, (ii) interventional or longitudinal observational studies are considered positive, particularly if the analyses include repeated exposure and outcome measures, and (iii) a study population that represents the target population (i.e. the working population) is considered positive. Alternative samples include a broad segment of the working population (e.g. a certain sector) or a narrow segment of the working population (e.g. pregnant women). We also comment on sample size and response rate.

Quality criteria were largely based on criteria of existing lists (Ariens, Van Mechelen, Bongers, Bouter, & Van Der Wal, 2000; Dewa, Loong, Bonato, & Hees, 2014; Hoefsmits, Houkes, & Nijhuis, 2012) and were selected based on their appropriateness for the type of studies included in the current review.

Data extraction and synthesis. Identified studies were heterogeneous in terms of operationalising sickness absence and work hours and in types of analyses conducted. We

therefore concluded that a meta-analysis was not possible and findings are presented in narrative form. The Standardized Index of Convergence (SIC) was used to supplement the narrative and summarise the findings (Nijp, Beckers, Geurts, Tucker, & Kompier, 2012; Nilsen, Skipstein, Østby, & Mykletun, 2017; Wielenga-Meijer, Taris, Kompier, & Wigboldus, 2010).

The SIC score is the number of significant positive relationships minus the number of significant negative relationships, divided by the total number of studies included (Wielenga-Meijer et al., 2010). The SIC score, combined with the number of studies investigating the relationship, indicates the strength of evidence as shown in Table 1 (Wielenga-Meijer et al., 2010). If the same paper reported more than one analysis, we still counted it as one finding to avoid inflating studies that reported multiple and similar analyses.

Results

Our systematic search of the literature identified 1072 papers and 5 additional papers from reference lists, resulting in 899 records after removing duplicates. After both authors read 899 abstracts, we assessed 187 full-text articles. After the selection process, 70 papers were selected for inclusion in this systematic literature review. We describe each of these papers and how they were coded in four appendices, which can be obtained upon request from the corresponding author.

The majority of papers operationalise work hours as working full-time, part-time, long work hours, or work hours as a continuous variable. We therefore give particular attention to these groups of studies below. We also pay particular attention to the three included intervention studies. Ten papers included overtime. Four of these papers reported a positive association between working overtime and sickness absence, and four papers reported a negative association between the two, yielding inconclusive findings ($SIC = (4-4)/10 = 0$). Four papers included contractual work hours as a continuous variable, and all four of these reported a significant positive relationship ($SIC = 4/4 = 1$). An additional four papers included work hour measures that were not easily grouped with the rest.

Full-time versus part-time work

Results of the 25 studies that compared sickness absence for full- and part-time employees were highly inconclusive, with 9 studies reporting a higher absence for full-time employees and 7 reporting a lower absence for full-time employees ($SIC = (9-7)/25 = -0.08$). The

Table 1. Strength of evidence.

Number of studies	SIC scores				
	-1.0 to -0.6	-0.59 to -0.30	-0.29 to 0.29	0.30 to 0.59	0.60 to 1.00
1-2	Insufficient evidence				
3-5	--	-	0	+	++
≥6	---	--	0	++	+++

Note: SIC: Standardized Index of Convergence; 0: inconsistent evidence; + (-): limited evidence for a positive (negative) relationship; ++(-): moderately strong evidence for a positive (negative) relationship; +++ (-): strong evidence for a positive (negative) relationship (Wielenga-Meijer et al., 2010).

number of studies is relatively large, and the majority (<60%) did report a significant association. The SIC score is inconclusive because the number of studies reporting a positive association was almost equal to the number reporting a negative association.

Four additional studies investigated the use of part-time contracts at a group level (i.e. the proportion of part-time employees at firms, municipalities, or countries; Chaudhury & Ng, 1992; Dellve, Karlberg, Allebeck, Herloff, & Hagberg, 2006; Livanos & Zangelidis, 2013; Lusinyan & Bonato, 2007). All four papers showed reduced sickness absence when the proportion of part-time employees was higher ($SIC = 4/4 = 1$). Because there are only four studies at the group level, we will focus on the individual level in this paper.

Study design. Of the 25 studies, 11 investigated the relationship between working full- or part-time and sickness absence, using longitudinal methods. Of these 11 studies, an equal number of studies reported a positive association and a negative association between working full-time and sickness absence ($SIC = (4-4)/11 = 0$). Two studies measured dependent and independent variables at multiple time-points, analysed with random effects. Both showed that part-time employees have significantly less sickness absences than full-time employees. Of 14 studies that used objective records of sickness absence, 8 also used objective records of work hours. Again, among the 14 studies using objective records, similar numbers of studies showed positive and negative associations between working full-time and sickness absence ($SIC = (3-4)/14 = -0.07$). Sample size varied from 56 to almost 7 million employees, and 12 studies had a response rate above 80%. Grouping studies by design did not yield results that were more conclusive.

Operationalisation of work hours. Several studies that investigated differences between full- and part-time work did not specify the number of hours full-time employees spent working nor the cut-off point between full- and part-time. In papers that do specify hours, part-time work was most commonly considered less than 35–37 hours a week. Two studies included more than one measure of part-time work. Brekke, Berg, Sletner, and Jenum (2013) found that employees working fewer part-time hours (10–50%) had significantly less sickness absence, but there was no significant difference between those working more part-time hours (50–80%) and full-time employees. Hansen, Thulstrup, Juhl, Kristensen, and Ramlau-Hansen (2015) found a significantly higher risk of sickness absence in employees working 30–36 hours and those working less than 30 hours a week, compared to those working 37 hours a week.

Operationalisation of sickness absence. In 14 of the 25 studies, absence was measured as a frequency. Seven studies focused on all forms of absence or short absences. Three of these seven reported a positive association between working full-time and absence, while one reported a negative association ($SIC = (3-1)/7 = 0.29$). Eight studies focused on medium and long absences, with two reporting a positive association and three reporting a negative association between working full-time and absence ($SIC = (2-3)/8 = -0.13$). In 12 studies, the absence duration was an outcome measure. In 2 of these 12 studies, a positive association was found, and in 6 studies, a negative association was found. Thus, there was moderate support for part-time employees having longer absence duration than full-time employees ($SIC = (2-6)/12 = -0.33$).

Generally, the measures most affected by frequent shorter absences (i.e. frequency of all spells and shorter spells) tended to indicate an increased risk of absence for full-time employees. The measures most affected by longer spells tended to indicate a reduced

risk of longer absences for full-time employees, but the evidence was not strong. Only Livanos and Zangelidis (2013) tested two absence measures. They found that part-time employees are significantly more likely to be absent *and* have longer absences, though the latter is only significant for women.

Population. Seven of the 25 studies focused on the general working population, of which 2 reported a positive association and 2 reported a negative association between working full-time and absence, yielding inconclusive results ($SIC = (2-2)/7 = 0$). Several of these studies used large representative national and European samples, such as the European Working Conditions Survey and The British Household Panel. Twelve studies focused on a relatively broad segment of the working population, and two studies focused on patients with specific ailments (e.g. stroke). Four studies focused on pregnant women ($SIC = (1-3)/4 = -0.5$), yielding some limited support for a negative relationship as one study reported a positive association and three studies reported a negative association between working full-time and absence. In addition to the studies focused on pregnant women, six studies focused specifically on women. Of these six, two reported a positive association and one reported a negative association between working full-time and sickness absence ($SIC = 2-1/6 = 0.17$). Two studies focused on men. Three studies were from Canada, and one from New Zealand, while the remaining 18 were from Europe.

The findings from the national representative samples were highly inconclusive (with a SIC score of 0, indicating a complete lack of evidence). There was a weak tendency for a negative relationship between working full-time and sickness absence for pregnant women.

Control variables. Important confounding variables included health, job characteristics, and motivation. Nine studies controlled for health, medical history, or previous absence. Even when controlling for health or previous absence, the studies were inconclusive with approximately the same number of studies reporting a negative association as the number of studies reporting a positive association ($SIC = (3-4)/9 = -0.17$).

Eleven studies controlled for psychosocial work factors (e.g. support and decision latitude), physical work factors (e.g. physical demands), type of occupation (e.g. blue-collar workers), or occupation. With 2 positive and 4 negative associations reported in the 11 studies, these results were also inconclusive ($SIC = (2-4)/11 = -0.22$).

No studies controlled directly for attendance motivation, but a few studies controlled for factors likely to be related to attendance motivation, including sick pay scheme, temporary work contract, being self-employed, and satisfaction/dissatisfaction with work. The findings remain inconclusive after controlling for these factors with one study reporting a positive association and two studies reporting a negative association between working full-time and absence ($SIC = (1-2)/5 = -0.20$).

It is also worth mentioning that two of these studies used the number of employers as a control variable (Livanos & Zangelidis, 2013; Sandmark, 2007). Both of these studies found significantly higher levels of absence among part-time employees.

Long work hours

The 17 papers that investigated the relationship between working more than 37 hours a week and sickness absence showed moderately strong evidence for a negative correlation between long work hours and sickness absence, suggesting that employees who work long

hours tend to have less sickness absence ($SIC = (2-9)/16 = -0.44$). Two of these papers had partially overlapping data (Magee, Caputi, & Lee, 2016; Magee, Stefanic, Caputi, & Iverson, 2011), and 2 used data from the same 10-town study in Finland but for different years (Ala-Mursula et al., 2006; Väänänen et al., 2005).

Janssens, Braeckman, De Clercq, De Bacquer, and Clays (2016) analysed the risk of sickness absence and presenteeism, grouping the employees into those who had neither sickness absence nor presenteeism, those who had no sickness absence but had presenteeism, those who had sickness absence but no presenteeism, and those who had both sickness absence and presenteeism. They found that employees working long hours had a lower risk of sickness absence without presenteeism and a higher risk of presenteeism with or without sickness absence. These findings, though interesting, are not easily reduced to a negative or positive correlation, thus they are not included in the SIC scores or results review below.

Study design. Of the 16 remaining studies, all 5 longitudinal papers that investigated the relationship between long work hours and sickness absence found significant negative effects ($SIC = -5/5 = -1$). These were all prospective cohort/survival analyses, comparing employees who worked long hours to employees who did not. All of the included papers used self-reported measures of work hours; however, six papers included objective measures of sickness absence. Of the six studies using objective measures, four reported a negative association, and only one reported a positive relationship ($SIC = (1-4)/6 = -0.5$). Only two papers had a response rate above 80%. Sample sizes varied from 413 to 49,708. Specifically, longitudinal studies and studies using objective measures of sickness absence further support the negative association between long work hours and sickness absence.

Population. For population, 7 of the 16 papers focused on the general working population or a random sample of full-time employees, several of which used large representative national or European surveys. Of the seven studies focusing on the general working population, six reported a negative association between long work hours and sickness absence ($SIC = -6/7 = -0.86$). Six studies focused on broad segments of the working population, such as union members, with two reporting a positive association and two reporting a negative association ($SIC = (2-2)/6 = 0$). Two papers focused on only pregnant women. Eight studies focused specifically on one or both genders. Four out of five studies reported a negative association for men ($SIC \text{ for men} = -4/5 = -0.8$). Five out of eight studies reported a negative association for women, while one study reported a positive association ($SIC \text{ for women} = (1-5)/8 = -0.5$). Only four studies were conducted outside of Europe – two in Australia, one in the Philippines, and one in Ethiopia. Overall, these 16 papers showed strong evidence for a negative correlation between long working hours and sickness absence in the general working population, and this correlation was present for both genders. There is insufficient evidence to determine whether this correlation exists outside Europe, and there is some indication that the association is not stable across all working population sub-groups.

Operationalisation of work hours. Collectively, there is moderately strong evidence for a negative correlation between working more than 48–50 hours a week and sickness absence. Out of 12 studies, investigating the relationship between working more than 48–50 hours a week and sickness absence, 7 reported a negative association and only 2 reported a positive association ($SIC = (2-7)/12 = -0.42$). The findings for working

between 38 and 48 hours a week are inconclusive, with three out of seven studies reporting a negative association and one study reporting a positive association ($SIC = (1-3)/7 = -0.29$). One study compared working more than 37 hours to working 37 hours, and one investigated working between 39 and 40 hours.

Operationalisation of sickness absence. All 16 studies looked at sickness absence without discriminating based on diagnosis. Ten studies used a frequency measure of sickness absence. Eight of these included all kinds of absence from 1 or 2 days or short absences. Five of these eight reported a negative association, and one reported a positive association ($SIC = (1-5)/8 = -0.5$). Five of the papers that used frequency measures focused on medium and long absences, with one paper reporting a positive association and one reporting a negative ($SIC = 1-1/5 = 0$). With respect to duration, five studies used total number of days of sickness absence as an outcome variable, and all five studies categorised the number of days (e.g. >2 days, 4-5 days, or >7 days of absence during the past 12 months). Of these, three reported a negative association ($SIC = -3/5 = -0.60$). Finally, three studies focused on the number of days of absence per spell or absent employee, and one of the three studies reported a positive association ($SIC = 1/3 = 0.33$). Generally, the measures most affected by frequent shorter absences (i.e. frequency of all spells and shorter spells) supported a reduced risk of absence for employees working long hours. The measures most affected by longer spells (i.e. frequency of medium and long absences and duration per spell) did not support any relationship.

Of the studies including more than one absence measure, two found a significant relationship between work hours and shorter rather than longer absences (Ala-Mursula et al., 2006; Laaksonen et al., 2010). Similarly, two studies found a significant negative relationship between long work hours and frequency of absence but a significant positive relationship or no significant relationship for days per absent employee (Lesuffleur et al., 2014; Niedhammer et al., 2013). In one study, neither frequency of absence nor days per absent employee were significantly related to work hours (Saurel-Cubizolles & Kaminski, 1987).

Considered together, there is a large heterogeneity in the measures used to capture sickness absence. However, particularly for papers including more than one absence measure, there is evidence that the negative relationship between long work hours and sickness absence is only present for shorter absences.

Control variables. Important confounding variables that could explain lower levels of sickness absence among employees working long hours include motivation, health, and job characteristics. Job characteristics have been controlled for in several ways, with different papers controlling for occupation, strain, psychosocial work environment, and shift work. Papers that include occupation and job characteristics as a control variable still strongly support the negative relationship between long work hours and sickness absence, with 8 out of 11 studies reporting a negative association ($SIC = -8/11 = -0.72$).

Two studies by Magee et al. (2011, 2016) both controlled for general health and still found significantly less sickness absence among employees working long hours. A few studies controlled for unhealthy behaviours such as alcohol consumption, smoking, being overweight, and prior sickness absence. One study controlled for chronic disease among pregnant women. All found a significant negative relationship between long work hours and sickness absence ($SIC = -5/5 = -1$).

No studies controlled for attendance motivation directly. Böckerman and Laukkanen (2010b) controlled for efficiency rules (i.e. employee responses confirmed the statement “In tough situations, efficiency rules out everything else”) and whether three days of self-certified paid absence was possible. They did not find a significant effect of working more than 48 hours; however, they did find a significant effect of working overtime. Magee et al. (2016) controlled for access to sickness absence benefits, and Laaksonen et al. (2010) controlled for job dissatisfaction. Both still found a significant negative relationship between work hours and sickness absence. Six papers controlled for job security and work contract (permanent/temporary), and five of these still found a significant negative association ($SIC = -5/6 = -0.83$).

It is worth noting that three studies included variables for both overtime work and for long work hours in the same analyses (Böckerman & Laukkanen, 2010b; de Castro et al., 2010; Tadesse, Ebrahim, & Gizaw, 2015). In two of these studies, overtime work, but not long work hours, was significantly related to less absence. The third found that higher absence correlated with overtime work and long work hours.

Work hours as a continuous variable

We identified 13 papers that investigated the relationship between work hours as a continuous variable and sickness absence. The general findings are inconsistent, with four papers reporting a positive association and three reporting a negative association ($SIC = (4-3)/13 = 0.08$). One paper showed a reverse U-shaped relationship in which increased work hours were significantly related to increased probability of sickness absence, except for employees who worked more than 44–48 hours, for whom the relationship was reversed.

Study design. Of the 13 studies, only two had a longitudinal design, both prospective cohorts. Only one study had a response rate above 80%. Sample size varied from 237 to 6.7 million. Eight of the studies used objective records to measure sickness absence, and four also used objective records for work hours. Out of the eight studies using objective measures, two reported a positive association, and three reported a negative association ($SIC = (2-3)/8 = -0.13$). The results remain inconsistent after accounting for study design.

Population. Of the 13 studies, 4 included representative working population samples, with one reporting a positive association and one reporting a negative association ($SIC = (1-1)/4 = 0$). Eight included broad segments of the working population, and one included only employees with depressive and anxiety disorders.

Operationalisation of sickness absence. Seven papers used duration of sickness absence (days, ratio of days/scheduled work, and ratio conditioned on having absence), two of which reported a positive association ($SIC = 2/7 = 0.29$). Five studies focused on the frequency of medium or long absences ($SIC = (2-2)/5 = 0$), and six focused on the frequency of short or any absence ($SIC = (2-2)/6 = 0$). The findings were inconclusive for both the frequency of medium/long absences and the frequency of short/any absence with equal numbers of studies reporting a positive association and studies reporting a negative association. One study included absence not due to sickness and one focused on cause-specific absence (i.e. mental disorders). The results were inconsistent after accounting for absence measures.

Control variables. Eight of the 13 studies controlled for occupation and job characteristics, such as demands. Of these eight, four reported a positive association, and one

reported a negative association ($SIC = (4-1)/8 = 0.38$). Five studies controlled for general health, history of sickness absence, or health indicators, such as BMI and sleep. Of these five, three reported a positive association, and two reported a negative association ($SIC = (3-2)/5 = 0.20$). Six studies included indicators likely related to attendance motivations, such as job security, work commitment, and reluctance to work, and one of these reported a positive association ($SIC = 1/6 = 0.17$).

Reduced work hours interventions

Three studies investigated the effects of interventions to reduce the number of work hours per week. McIntyre, Winfield, Sen Te, and Crook (2010) focused on implementing a 48-hour limit for junior doctors. The hospital did not hire extra staff to compensate for the fewer hours, and inpatient care was also reorganised during this period. There was a significant increase in junior doctors taking sick leave. von Thiele Schwarz and Hasson (2011) investigated the effect of reducing weekly work hours by 2.5 hours in a randomised controlled trial. The reduced work hour group had no significant changes in absence. The control group had no significant changes in frequency but had a significant increase in duration of absence. Akerstedt, Olsson, Ingre, Holmgren, and Kecklund (2001) investigated the effect of reducing a 39-hour work week to 30 hours on health and well-being. Person-hours spent working were kept constant by employing new staff. There was no significant effect on sickness absence.

Discussion

The purpose of this paper was to systematically review empirical papers that investigated the relationship between work hours and sickness absence. We identified 70 studies investigating this relationship. The majority of these studies investigated work hours as either part-time/full-time, long work hours, or work hours as a continuous variable. The findings were inconclusive with regard to the relationship between working part-time/full-time, work hours as a continuous variable, and sickness absence. The findings did support that employees working long hours had a lower incidence of sickness absence.

Additionally, three intervention studies yielded inconclusive results. Interestingly, the design and text of the three intervention studies also highlighted differences between working shorter hours with an equal reduction in work tasks and responsibility and the need to complete the same amount of work in a shorter time. It is likely that employees who typically work long hours (in part) do so because they have more work to do after an eight-hour day has ended. If so, to simply reduce the number of hours an employee is supposed to work without simultaneously reducing the workload could create new problems for the employee.

Part-time versus full-time work

We identified 25 studies that investigated the relationship between part-time work and sickness absence. The results were inconclusive, with several studies showing significant differences in both directions. There are some indications that the relationship might be in the opposite direction for long and short absences, with part-time employees

having fewer short absences but being at a higher risk for longer absences. The results also seem to depend on whether the part-time work involves shorter or longer hours. Few studies have explicitly tested the difference between several types of part-time work.

Our review included longitudinal studies, studies with large, representative samples, and studies with both objective exposure and outcome measures. After accounting for study design, the results were still inconclusive. It is therefore unlikely that more or better quality studies will clarify the relationship, unless they go beyond simply testing the correlation between working part-time or full-time and sickness absence.

None of the identified studies statistically tested explanations for why part-time employee absence may differ from that of full-time employees. There may be multiple causes for this difference that pull in different directions. As mentioned in the introduction, sickness absence is a multi-factorial and complex issue. These multiple factors might be weighted differently in different populations and for absences of different lengths. The results indicated higher odds of long-term sickness absence for part-time employees than full-time employees, which could reflect a healthy worker effect, where unhealthy employees are more likely to work part-time. Because long-term sickness absence is more highly correlated with health than is short-term sickness absence (Marmot et al., 1995), we might expect the negative relationship to be stronger for long-term absence. However, controlling for health or past sickness absence does little to clarify the results.

The results indicate lower odds of short-term sickness absence for part-time employees than for full-time employees. These results suggest that employees working part-time involuntarily may be particularly motivated to attend work, in hopes of obtaining a full-time contract. Such motivation would likely affect short-term absence. In addition, part-time employees may have more time to recuperate and do not need sickness absence to the same extent. Lower short-term sickness absence among part-time employees could also be explained by the income-leisure trade-off model, adapted from the field of economics. When applied to sickness absence, this model predicts that part-time employees with more spare time will not appreciate an additional day off from work as much as employees with a scarcer amount of spare time. For the latter group of employees, an additional day off yields more value. The model thus can be used to explain employees' motivation for attending (and not attending) work, which likely has a greater impact on short-term absence. As none of the studies test these explanations, they remain speculative. Additionally, there might be important unobserved differences between the samples, such as differences in whether part-time work is voluntary or not or how common it is to be held as a second job. This review included studies from different countries with varying legislations, cultures, and economic and labour market conditions, and these differences may also affect the norms, possibilities, and relationships of part-time work and sickness absence. Future studies should investigate the potential heterogeneity in these relationships and the significance of different theoretical and contextual explanations.

Long work hours

The 17 identified studies investigating the relationship between long work hours and sickness absence showed a negative correlation, with employees who work more hours taking fewer leaves of absence. The relationship was particularly clear for employees who work more than 48–50 hours a week. Shorter absences tended to be most affected.

Many of the studies included large, representative samples of the working population, indicating that the findings are generalisable. We identified five longitudinal studies, all of which were prospective cohort/survival analyses, comparing employees who work longer hours to those who work shorter hours. Selection effects remain a challenge to any conclusion regarding causality. One notable exception is the intervention study by McIntyre et al. (2010) that showed a significant increase in sickness absence among junior doctors after implementing a 48-hour limit roster. One explanation is that the doctors' experience increased stress when performing the same tasks in a shorter time period.

In terms of actual number of hours spent working, the distinction between studies that compared full- and part-time work and those that investigated long work hours was not straightforward. For example, while Väänänen et al. (2005) used full-time employees who worked 38 hours or less as their reference group, Barmby, Orme, and Treble (1995) compared full-time employees (working 39 hours or more) to part-time employees (working 38 hours or less). Because the distinction between full- and part-time is often a question of type of employment contract, we decided to treat these two categories as distinct.

Work hours as a continuous variable

The 13 identified studies investigating the relationship between work hours as a continuous variable and sickness absence yielded inconclusive results. Based on differences in the results of studies that focused on long work hours and those that focused on part- and full-time employees, we expected the results to be inconclusive. When analysing work hours as a continuous variable, the relationship with sickness absence is often assumed to be linear (i.e. the difference between working 25 and 40 hours a week and between working 40 and 55 hours a week is assumed to be the same). Only one study using work hours as a continuous variable considered this issue by adding an exponential work hour variable.

Theoretical explanation and practical implications

A negative relationship between long work hours and sickness absence was the main conclusive result of this review. The theoretical explanation and practical implications of this relationship warrant further attention. There are three general explanations for the negative relationship between long work hours and sickness absence – the healthy worker effect, differences in job characteristics, and attendance motivation. None of the included studies statistically tested these explanations. This is relevant because policy implications of the findings will depend on the theoretical explanation.

The healthy worker effect implies that employees self-regulate and work shorter hours if their health demands it. If we accept, as discussed in the introduction, that long work hours are in general a health hazard, it might be advantageous for employees to self-regulate and not work such long hours if their health does not permit it. The healthy worker effect implies that the relationship between long work hours and sickness absence would not be significant, or substantially reduced, after controlling for health. Studies that controlled for general health, chronic disease, or unhealthy behaviour still all found a significant negative relationship between working long hours and sickness absence, showing that this relationship is not solely due to the healthy worker effect. If the healthy worker effect were an important explanation, we would expect to find significantly lower odds of long-

term sickness absence because long-term sickness absence is highly correlated with health (Marmot et al., 1995). The lack of support for a relationship between long work hours and long-term sickness absence indicates that factors other than health are important.

Differences in job characteristics imply that employees who work longer hours have fewer incidences of sickness absence because of specific job characteristics, for example blue-collar workers who work fixed schedules are less likely to work long hours and more likely to take leaves of absence. If employees who have healthier jobs work longer hours, the relationship between long work hours and sickness absence would be less important to managers and policy-makers. However, several papers controlled for occupation and physical and psychosocial work factors and still found a significant relationship.

High attendance motivation might lead employees to work longer hours and avoid sickness absence. It may be fuelled by factors such as high job satisfaction, a feeling of being irreplaceable, high work pressure, and group norms (e.g. Steers & Rhodes, 1978). Although attendance motivation was not included in any of the studies, there is some support for this explanation. The fact that shorter absences tend to be more affected can support the motivation argument. Papers linking long work hours to presenteeism further support this argument (Böckerman & Laukkanen, 2010b; Hansen & Andersen, 2008). Janssens et al. (2016) found that employees who work long hours are significantly less likely to be absent without presenteeism but significantly more likely to display presenteeism with or without absence. These findings are consistent with employees working long hours, more often choosing presenteeism over absence. Only the results of the intervention study by McIntyre et al. (2010) are difficult to explain based on attendance motivation.

If the negative relationship between work hours and sickness absence is due to differences in attendance motivation that affects both work hours and absence, its implications are important to discuss. If attendance motivation induces employees to work longer hours *and* keep working while ill, it might be a double hazard, as presenteeism has also been related to poorer health (Gustafsson & Marklund, 2011; Kivimäki et al., 2005). HR managers and leaders should be aware that in high-pressure periods or among employees who work particularly long hours, sickness absence seems to be a poor indicator of health. As sickness absence is often management's only indicator of employee health, a low incidence of sickness absence might create a false sense of security regarding employee health.

Thus, there is some support for attendance motivation as an explanation for the relationship between long work hours and sickness absence. However, there is a lack of strong empirical evidence supporting any of the possible explanations. Since different theoretical explanations would certainly influence policy decisions, future studies should test these theories explicitly, preferably combining quantitative and qualitative (in-depth) analyses.

Methodological considerations and limitations

Unpublished studies. Publication bias (i.e. papers showing significant findings are more likely to be published) is always a risk in literature reviews (Franco, Malhotra, & Simonovits, 2014). In the current literature, the risk of publication bias is most obvious in case of differences between full-time and part-time employees. Of 25 studies, 16 found significant

results, with the number reporting a positive association being about equal to the number reporting a negative association. Although a large number of studies showed a significant relationship between part-time or full-time work and sickness absence, we cannot reject the null hypothesis.

Multiple absence measures in one paper. Several of the papers included multiple measures of sickness absence. Some of these studies found significant positive relationships between work hours and one measure but not another. There might be theoretical reasons to include and compare more than one measure of absence. However, including multiple measures also increases the probability of obtaining significant p values by chance. The extent to which the authors theoretically justified their inclusion of more than one measure and discussed reasons for the differences in the results varied between papers.

Method. We only identified three intervention studies. Further intervention studies designed to investigate the relationship between work hours and sickness absence would help to strengthen causal interpretation of the findings.

Some existing trials for implementing a six-hour workday fell outside the scope of this paper due to either being unpublished trials or based on qualitative analyses (e.g. Enehaug, 2017).

Representative samples. Several of the studies had large representative national and European samples. However, there was a lack of studies conducted outside Europe.

Conclusions

This systematic literature review includes a large number of studies that investigated the relationship between work hours and sickness absence. Our most conclusive finding is that long work hours correlate with reduced sickness absence. In particular, working more than 48 hours a week correlates with reduced short-term sickness absence. The relationship between working part- or full-time and sickness absence and between work hours as a continuous variable and sickness absence is still inconclusive. These papers also showed a weak tendency for part-time employees to have fewer short-term absences and more long-term absences. Sickness absence is often management's only indicator of employee health. One explanation of the negative relationship between long work hours and sickness absence is that high attendance motivation leads employees to work unhealthy hours and refrain from being absent while ill. In such cases, low sickness absences could mask potentially serious health risks. These findings imply that managers and employers should pay close attention to employee health and vitality, even when sickness absence is low.

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