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Work intensity: identification and analysis of key determinants

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Abstract

Purpose – The purpose of the paper is to investigate determinants of work intensity as a much-discussed topic in the modern working world, especially against the background of increasing processes of work acceleration and numerous indications that high work intensity can pose a health risk for employees.

Design/methodology/approach – Based on four different representative employee surveys (BIBB/BAuA Employment Survey 2018; BAuA-Working Time Survey 2015; European Working Condition Survey 2015; DGB Index 2018) in Germany, we examine the relationship between various individual and work-related characteristics and a high work intensity. Using ordinary least squares regressions, we estimated linear probability models for the analysis of the determinants of work intensity.

Findings – Our findings indicate that work intensity is a multifactorial phenomenon that can have different causes. These range from individual characteristics such as gender, higher vocational training or leadership responsibility to context factors such as restructuring at workplace or social support from supervisors and colleagues. Our research particularly shows that restructuring in the company, job insecurity, poor leadership competence of a supervisor, management responsibility or excessive long working hours are associated with increased work intensity across the four surveys analyzed.

Originality/value – The unique feature of this paper is that comparable multivariate regression analyses based on four different representative employment surveys are conducted. Hence, our research paper provides robust findings on the determinants of increased work intensity across multiple datasets.

Keywords Work intensity, Work demand, Occupational health and safety, Workplace, Stress, OLS regression

Paper type Research paper

1. Introduction

The working world is undergoing serious change. Increasing acceleration at the level of society as a whole (Rosa, 2005), constant restructuring at the company level and a rapidly changing work environment are increasing the pressure on employees (Green, 2004a, b; Green *et al.*, 2022; Kubicek *et al.*, 2015). Many employees describe a constant work intensification, e.g. characterized by the feeling that more and more has to be done in less time or a persistently high work intensity, including deadlines and pressure to perform (Franke, 2015; Korunka, 2020). Hartmut Rosa (2005) offers an explanatory approach with his concept of "social acceleration", which is based on economic and social megatrends. This involves the shift from production to the services sector, globalization, the flexibilization and dissolution of boundaries in work and organizational structures, as well as a further spread of information and communication technologies (ICT).

According to Rosa (Rosa, 2005), activity episodes undergo shortening and condensation as a response to processes of both technical advancement and social acceleration. With the reduction of action times, the idle interval between two activities diminishes, necessitating the simultaneous execution of multiple tasks. Such an increase in the pace of life represents an

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endeavor to keep up with environmental changes, but this acceleration, however, does not leave working life unaffected. The integration of novel and progressively more powerful ICT in the working world drives a continuous acceleration of production, service and communication processes. In addition, there is a growing complexity in job requirements across all sectors (Bosch *et al.*, 2017), coupled with an amplified need for employees to engage in learning (acceleration; Rosa, 2005). Overall, changes in the labor market are associated with higher expected productivity (i.e. less available working time to fulfill more requirements) and higher cognitive requirements (i.e. generating novel knowledge, being confronted with new tasks or resolving problems; Green *et al.*, 2022; Meyer and Hünefeld, 2018). These changes are directly reflected in the employees' quality of work in the form of increased quantitative intensity as well as qualitative intensity (Burke *et al.*, 2009; Green, 2001, 2006; Korunka and Kubicek, 2017).

There is also extensive evidence that high and increasing work intensity can represent a health risk for employees (Beermann *et al.*, 2018; Løkke and Madsen, 2014; Seiler *et al.*, 2013) and is associated with considerable economic costs through (avoidable) sickness absenteeism (BAuA, 2019). Limiting these negative health and economic consequences is a central challenge for in-company and inter-company stakeholders. To be able to contain the health risks of ongoing high work intensity for employees, a fundamental understanding of their causes is required.

Various existing studies investigated the determinants of work intensity and intensification by focusing, among other things, on rationalization processes (Kelly and Moen, 2020; Sauer, 2005), technological change (Chesley, 2014; Menon *et al.*, 2019) or associated changes in work and organization (Green, 2004a; Kratzer, 2020). However, the evidence on the determinants of work intensity is inconsistent. For instance, Menon *et al.* (2019) reported insignificant associations between computer use and work intensity, while Green *et al.* (2022) found higher work intensity among computer users. These ambiguous findings may be due to differences in data as well as the methodological approach (Green *et al.*, 2022) but also regarding the operationalization of work intensity and work intensification (Green *et al.*, 2018; Horner *et al.*, 2012; Meyer and Hünefeld, 2018). In addition, the studies are based on different occupational and/or organizational and national contexts (e.g. Burke *et al.*, 2010; Fiksenbaum *et al.*, 2010; Granter *et al.*, 2019; Piasna, 2018). Variations in such context factors on a macroeconomic level, such as social welfare systems and unemployment rates (Adăscăliţei *et al.*, 2022), as well as on an organizational level, like work climate or internal regulations, could also affect the relationship between other determinants and work intensity or work intensification (Chesley, 2014; Meyer and Hünefeld, 2021). Furthermore, existing studies often focus on specific determinants of work intensity (Chesley, 2014) or work intensification (Mauno *et al.*, 2019). To our knowledge, relevant aspects such as the size of the company, the existence of a works council, collegiality and leadership quality have received little attention to date. In addition, the literature lacks research examining the determinants of work intensity in a more comprehensive way, i.e. across different occupational groups or organizational contexts. Against this background, the aim of our study is to identify potential individual and work-related determinants of increased work intensity and intensification in Germany. Our study contributes to existing research in mainly two ways: First, we examine the importance of well-documented determinants (e.g. working time, technical requirements and restructuring) as well as the role of yet less researched determinants, such as firm size, leadership quality and social support from colleagues, for work intensity and intensification. To obtain comparable results and assess the relative importance of each determinant, we consider different indicators of work intensity. Studying the determinants of work intensity in a comprehensive way, we aim to identify particularly vulnerable groups and derive first implications for designing healthy work environments for different groups of employees. Second, we explore the determinants of work intensity using large-scale data sets at the employee level. Specifically, we perform empirical analyses based on four different German employment surveys aiming to replicate our findings. In this way, we explore the robustness of our findings and reduce the likelihood of

potential biases such as sampling or alpha errors. Overall, our comprehensive analyses aim to provide credible results in order to derive valid conclusions.

2. State of research

2.1 Work intensity and intensification

The state of research to date reveals that there is currently no common overarching definition or theory of work intensity and intensification, although there is a wealth of empirical research on the subject (e.g. Burchell and Fagan, 2004; Green *et al.*, 2022; Soucek and Voss, 2020). Researchers from different disciplines apply different concepts, like work effort (Green, 2001), speed of work (Burchell and Fagan, 2004) or workload (Bakker *et al.*, 2005; Shaw and Weekley, 1985), to describe aspects of work intensity. In this paper, we use a comprehensive approach covering various dimensions of work intensity mentioned above. Overall, the level of work intensity is characterized by three central conditions: (1) the quantity of work, (2) the time available in which that quantity must be completed or the pace of the work to be carried out and (3) the complexity of the work task (see Hünefeld *et al.*, 2021).

This definition of work intensity is close to that of Rau and Göllner (2018), who mainly describe work intensity as the amount of work to be done per unit of time, but referring to cognitive effort. This is because the cognitive effort required to perform the task (Hacker and Sachse, 2014) determines whether more or less work can be achieved per unit of time (Rau and Göllner, 2018). Regardless of the different definitions, work intensity results from a complex interaction of quantitative and qualitative requirements and encompasses several facets, including the number of tasks to be performed, speed and time in which a certain work is to be performed, complexity of work and the required quality of the work results (Stab and Schulz-Dadaczynski, 2017).

In this context, work intensity and work intensification must be distinguished from one another. Work intensity describes the state of the required work demands or the current mismatch between work quantity, time and complexity. Work intensification is characterized by the perception of an increase in intensity (Franke, 2015; Korunka, 2020; Kubicek and Tement, 2016).

In addition to the definition of work intensity as a relation of quantity, time and/or tempo and complexity, the extension of work is another dimension. The extension of working hours includes both the extension of daily working hours as well as work carried out on days off and the omission of breaks. Such an "extensification" of work (Green, 2001) is not only accompanied by (unpaid) overtime, but it also shortens recovery times that are relevant to employee health.

2.2 Determinants of work intensity and intensification

The existing literature (e.g. Green *et al.*, 2022; see Hünefeld *et al.*, 2021) considers various aspects that contribute to high work intensity and work intensification, which can be broadly divided into individual and work-related characteristics (Burke *et al.*, 2010; Mauno *et al.*, 2019). Studies that examine the correlation of individual characteristics, such as gender, age or socioeconomic status (i.e. education, income and occupational positions) indicate that certain groups are more affected by high work intensity and/or intensification. However, the results are inconsistent. For example, Mauno *et al.* (2019) and Fiksenbaum *et al.* (2010) show that primarily younger employees and men report higher work intensity and work intensification. In contrast, Green *et al.* (2022) and Burchell and Fagan (2004) find higher work intensity among women. Similar ambiguous results can also be found for other factors, such as socioeconomic status. In a cross-country comparison, Paškvan and Kubicek (2017) find that the association between education and work intensification differs across countries. For instance, while they find that less educated employees report higher work intensification in Germany, it tends to be the more highly educated in the USA. This difference might be due to the different existing resources and work requirements of the

groups considered (Green *et al.*, 2022; Mauno *et al.*, 2019). Relatedly, various studies point to differences across occupations (e.g. Green *et al.*, 2018; Fiksenbaum *et al.*, 2010; Lohmann-Haislah, 2012; Korunka, 2020). For instance, Ahlers *et al.* (2020) as well as Green *et al.* (2018) show that work intensity in different occupational groups is characterized by different aspects. For example, occupations with service activities seem to be confronted with multitasking and disruptions, whereas a high work pace is particularly evident in food and hospitality as well as transport and logistics occupations (Ahlers *et al.*, 2020). Furthermore, Mauno *et al.* (2019) argue that employees in the private and public sectors might experience different specifications of work intensity. In recent decades, for example, the public sector in particular has been characterized by extensive restructuring with job cuts and increasing client demands (Dollard and Walsh, 1999; Le Fevre *et al.*, 2015). In addition, the introduction of new technologies is unevenly distributed across different sectors, and the types of technologies used are different (Meyer *et al.*, 2019).

This may be reflected in both different levels as well as different aspects of work intensity (i.e. quantity, time or complexity) in the different sectors.

Against the background of work-related determinants of work intensity, the following three interrelated factors are particularly discussed as overarching drivers:

(1) Digitalization;

(2) Flexibilization and

(3) Rationalization processes.

Technological innovation tends to increase work intensity, especially by accelerating information and work processes and by increasing the amount of information that has to be processed more quickly (Carstensen, 2015). At the same time, modern ICT enables working anywhere and anytime, which might involve more autonomy and improved compatibility, but also more stress due to constant accessibility and the dissolution of boundaries between work and private life (Kelly and Moen, 2020; Demerouti *et al.*, 2014; Carstensen, 2015). In recent years, more studies have explored the introduction or use of ICT, since working with ICT is regarded as the main cause of the technological and associated social acceleration of work. Some studies demonstrated that the introduction and/or use of ICT at work seems to be an important determinant of high work intensity (Green and McIntosh, 2001; Green, 2004a, b; Chesley, 2014). By contrast, Bittman *et al.* (2009) and Menon *et al.* (2019) found only small or no associations between ICT use and work intensity.

In the context of the digitalization and flexibilization of work, the forms of work and organization in companies are constantly changing (Cascio, 2003). Anglo-Saxon studies point out that flexible forms of work may pose a risk to high work intensity (Green, 2004a, b; Kelliher and Anderson, 2008, 2010). In a mixed-method analysis of employees with flexible work arrangements, Kelliher and Anderson (2010) found that the flexibility in work hours and location encouraged high work intensity, describing this development as “enabled” intensification. Similarly, a German study of works councils showed that companies where employees mainly work flexibly via trust-based working time and with results-oriented target agreements report significantly more often high work pressure and work intensity than employees in companies with traditional work organization structures (Ahlers, 2018). Taken together, this indicates that employees seem to trade the opportunity to work flexibly by offering to work more intensively and efficiently via flexible models, which often involves working overtime and a work-life imbalance.

Digitization and flexibilization are embedded in ongoing processes of operational change and restructuring to meet the growing pressure and adapt to market requirements (Rothe and Beermann, 2014). Studies suggest that work intensification might also be seen as a consequence of increasing competition, cost and performance pressure in the course of organizational restructuring processes, with companies demanding that their employees do

more and more with fewer and fewer resources (Dunkel and Kratzer, 2016; Kelly and Moen, 2020). Job cuts, frequent restructuring and the use of temporary employment contracts are also an expression of this cost pressure, likely leading to job insecurity for employees. However, the empirical evidence is ambiguous. While the majority of studies on restructuring and downsizing point to a correlation between increased work intensity and work intensification (Sauer, 2005), the findings of studies exploring job insecurity and temporary employment are mixed (Adăscăliței *et al.*, 2022; Gallie, 2005; Gallie and Zhou, 2013; Green *et al.*, 2022).

In addition to the demanding effects related to the three main drivers – digitalization, flexibilization and rationalization – resources that might reduce work intensity are also important. Based on Karasek's model of job demand and control (Karasek, 1979), job control and social support in the workplace have been found to be crucial resources in job stress research (Mauno *et al.*, 2019). Regarding the social support of colleagues and supervisors, three main functions can be identified: First, support can reduce employees' workload in the sense that, for instance, they are shown ways to resolve difficulties with work tasks and unclear priorities. Second, support can also counteract health complaints and reduce the level of stress. For example, feeling that you can rely on others for help when needed can reduce stress. Third, the negative effects of work demands such as deadline pressure can be "buffered" by help and support, as it enables employees to cope more easily with the demand (Stadler and Spieß, 2003). While the last two functions mentioned have already been studied more extensively in the context of work intensity, there are few studies to date on social support as a determinant of work intensity (Viswesvaran *et al.*, 1999). Initial studies indicate that a lack of social support is associated with higher work intensity and work intensification (Mansour *et al.*, 2022; Mauno *et al.*, 2019; Neirotti, 2018). Furthermore, studies indicate that in addition to social support from supervisors, other behaviors of the latter are also related to work intensity (Fairris, 2004). The specific design of the working conditions, including the intensity of the work, also depends to a large extent on the supervisor. However, only a few studies empirically examine the relationship of supervisor behavior or leadership style and work intensity. Some studies show that fair and transformational leadership is related to less work intensity (Stordeur *et al.*, 2001; Testad *et al.*, 2010), whereas self-centered and non-listening leadership is related to increased work demands (Theorell *et al.*, 2012).

Although the studies mentioned above already indicate correlations between individual and work-related factors and high work intensity as well as work intensification among employees, there is no consistent picture of the determinants of work intensity and work intensification. Differences may be due to both methodological and data differences (Green *et al.*, 2022), limiting the comparability of the studies. This also applies, among other things, to different operationalization of work intensity and intensification (Green *et al.*, 2018; Horner *et al.*, 2012; Meyer and Hünefeld, 2021). For example, some studies use sum scales or indices combining different aspects of work intensity (Huo *et al.*, 2022; Paškvan *et al.*, 2016; Sayin *et al.*, 2021). Other studies, however, only examine single items of work intensity, such as the pace of work, (e.g. Chesley, 2014; Bittman *et al.*, 2009), multitasking, etc. In addition, the studies refer to different contexts, such as different occupations, organizations or countries (e.g. Burke *et al.*, 2010; Fiksenbaum *et al.*, 2010; Granter *et al.*, 2019; Piasna, 2018). Differences in macroeconomic factors (e.g. social welfare systems and unemployment rates; Adăscăliț;ei *et al.*, 2022) or organizational factors, like work climate or internal regulations, could affect the relation of determinants and work intensity and intensification (Chesley, 2014; Meyer and Hünefeld, 2021). In addition, equally relevant work-related aspects such as the size of the company, the existence of a works council, social support and leadership quality have received almost no attention as determinants of work intensity. A look at the current state of research thus reveals gaps and makes it clear that robust and comparable findings on the determinants of high work intensity are lacking. Therefore, we address the research question of which individual (e.g. gender, age, education and management responsibility) and work-related factors (e.g. use of technologies, restructuring processes and social support) prove to be robust

determinants of work intensity and work intensification. In order to answer this question, we analyzed the relationship between work intensity and potential determinants in Germany on the basis of four different representative employment surveys. In this way, we investigated whether the correlations shown in previous studies are also robust across different data sets, and these are complemented by further findings.

3. Method

3.1 Data and operationalization

In a previous publication (see Hünefeld *et al.*, 2021), we addressed the analysis potential of employee surveys with regard to the topic of "work intensity and its determinants," following the conceptualization of work intensity described above.

Employment surveys are particularly suitable for the research question at hand, as they usually contain indicators of work intensity and provide information on the working conditions and context of employees. We identified four employment surveys (BIBB/BAuA Employment Survey, 2018; BAuA-Working Time Survey, 2015; European Working Condition Survey, 2015 (EWCS, 2015); DGB Index, 2018) that contain comparable indicators of work intensity along the categories of quantity, time and complexity as well as indicators of work intensification and extensification (see Table 1).

Just as there are no uniform theories and definitions of work intensity, there is also no uniform operationalization. For example, in their review of the correlation between work intensity and mental health, Stab *et al.* (2016) and Stab and Schulz-Dadaczynski (2017) found more than 50 instruments measuring work intensity. In general, work intensity can be measured both objectively and subjectively. Possibilities of objective measurement for the amount of work are, for example, counting the number of tasks to be handled or the number of customer requests (Häusser *et al.*, 2011; Mazloum *et al.*, 2008; Tully and Buchan, 2009). The time dimension of work intensity can be measured, for example, by the processing time (Hockey and Earle, 2006; Tsiga *et al.*, 2013). These rather objective measurements are mainly applied in observational and experimental studies, whereas the subjective measurement of work intensity is often used in survey studies in which the respondents themselves assess the level of their work intensity (Green, 2004a, b; Green *et al.*, 2022; Kubicek *et al.*, 2015). A number of items have become established in survey studies to examine work intensity (see also Stab and Schulz-Dadaczynski, 2016). For example, a general question to measure work

Table 1. Operationalization of work intensity[a]

Main categories	Characteristics of work intensity	Operationalization
Time:	Pace of work[b]	Affected by having to work very quickly and a generally heightened pace of work
Quantity/Time:	Deadline/performance pressure	Quantitative demands of the work or increase in the quantity of work
Complexity:	Disruptions and multitasking	Disruption and interruptions at work or multitasking demands
Work intensification:	Increase in intensity[c]	Increase in work pressure or stress, the feeling of having to do more than before
Extensification:	Excessive working hours	Regularly worked overtime and extra work

Note(s): [a]The specific operationalization of the individual items in the various employment surveys can be found in Table 3 in the Appendix
[b]No item for "working fast" could be identified in the DGB Index 2018
[c]No item for "increase in intensity" could be identified in the EWCS 2015
Source(s): Authors' own work

intensity is "My job requires that I work very hard" (Green *et al.*, 2022; Kalleberg, 2011). To measure the amount of work, a common question asked, "Do you have too much work to do?" (Bakker *et al.*, 2005), and to measure the time dimension of work, it is often asked "Do you work under time pressure?" or "How often does your job require you to work very fast? (Avgoustaki and Frankort, 2019; Menon *et al.*, 2019; Piasna, 2018). Items such as multitasking, interruptions or high levels of concentration are used to represent the work complexity (Chesley, 2014; Lyons *et al.*, 2022). For work intensification, especially operationalizations such as change of work pressure, rising level of work demands or increased multitasking demands are used (Franke, 2015; Mauno *et al.*, 2023; Sayin *et al.*, 2021). To measure "extension of work," studies predominantly use (long) working hours (Boxall and Macky, 2014; Brown, 2012).

In line with most of the previous literature (e.g. Burke *et al.*, 2010; Green, 2001; Green *et al.*, 2018, 2022; Franke, 2015; Kubicek and Tement, 2016; Menon *et al.*, 2019), we focus on the employees' subjective assessments of work intensity in this paper. Specifically, the following indicators were selected: pace of work, deadline and/or performance pressure, disruptions, multitasking, increase in work intensity and excessive working hours (see Table 1 and Appendix Table 3).

In the state of research, both individual and work-related factors have been identified as determinants of work intensity (cf. Chapter 2). We categorize the potential determinants of high work intensity as follows:

(1) Individual characteristics: gender, age, school and/or training qualifications, income and leadership responsibility;

(2) Company characteristics: company size, private and/or public enterprise, economic sector, existence of a staff and/or works council;

(3) Working time: full-time and/or part-time, actual working time per week and compatibility of work and family are assigned to this category;

(4) Technical work requirements: technical requirements of the activities or work with technology;

(5) Insecurity: temporary employment, restructuring, job cuts and job insecurity and

(6) Support: Praise and/or recognition from supervisor and support at the workplace from colleagues and supervisors.

In total, 21 comparable determinants of work intensity were identified in at least 3 of the 4 data sets [1]. In order to further increase the comparability of the individual items for the following analyses, the response categories were adjusted on the basis of content and distribution aspects. In order to keep the analyses as simple as possible, the response categories of the dependent variables on work intensity were also dichotomized (1 = frequent occurrence and 0 = infrequent occurrence).

3.1.1 Methodology. For the analysis of the determinants, ordinary least squares regressions were estimated, in which the variables for work intensity were used as dependents and the variables for the determinants as predictors. Since the variables for high work intensity are dichotomous, linear probability models were calculated. Thus, statements can be made on how the probability of experiencing a certain aspect of high work intensity differs between varying characteristics of the determinants or groups of employees [2].

In total, seven models were calculated for each of the six work intensity indicators for the four selected data sets, including different sets of variables. First, a basic model was calculated that includes various individual characteristics (gender, age, full and/or part-time, school education and professional and/or vocational training) and company characteristics (company size and economic sector). Within the framework of the other six main models, possible determinants were tested block by block, with the variables taken from the basic model always

included as control variables (A: further individual characteristics, i.e. income and leadership responsibility; B: further company-related characteristics, i.e. private and/or public enterprise and the existence of a staff and/or works council; C: working time; D: technical work requirements; E: insecurity and F: support).

When interpreting the results, it must be taken into account that no causal relationships can be identified on the basis of the available analyses. Thus, the correlations may be biased due to unobserved third variables or may also be interpreted as reverse causality (e.g. between compatibility and work intensity). The aim instead is to show robust correlations of certain (individual, company and workplace-related) characteristics with work intensity, for which the selected employment surveys are nevertheless well suited due to their thematic relevance and comparability as well as due to their representativeness for the German workforce.

In order to make the samples of the different surveys as comparable as possible, we restrict the samples to all dependent employees aged between 15 and 65 who work at least 10 h per week [3]. After cleaning the data, the sample [4] of the 2018 BIBB-BAuA Employment Survey includes 16,774 respondents, the 2015 BAuA-Working Time Survey includes 16,195 respondents, the EWCS includes 1,702 respondents, and the 2018 DGB Index includes 6,813 respondents.

4. Results: associations between potential determinants and work intensity

In the first step, the basic model described above is used to investigate the question of whether the selected individual and company characteristics are linked to aspects of high work intensity. Table 2 provides a qualitative overview of the results that emerge across the different data sets. Findings that were mostly consistent across the surveys have been included in this table. An overview of the regression models can be found in the Appendix (see Table 1).

The results indicate that women report more frequently high work intensity (deadline and/or performance pressure, disruptions and multitasking) and work intensification but consistently report less frequent work extension, i.e. working excessively long hours (extensification) than men. Women, for example, are five (EWCS 2015; DGB Index 2018) to nine (BIBB/BAuA Employment Survey 2018) percentage points more likely to report disruptions than men. Women report being more affected by a fast pace of work only in the BIBB/BAuA Employment Survey 2018 and the BAuA-Working Time Survey 2015.

Table 2. Basic model – groups particularly affected by work intensity

Work intensity	Determinants
Pace of work	Female, full-time (≥35 h/week), medium and large enterprises
Deadline/performance pressure	Female, full-time (≥35 h/week), complex specialist job, medium and large companies
Disruptions	Female, full-time (≥35 h/week), 55–65 years old, medium and high-level education, complex specialist job, medium and large enterprises
Multitasking	Female, full-time (≥35 h/week), medium and high-level education, complex specialist job and highly complex job
Increase in intensity	Female, full-time (≥35 h/week), 45–54 years old and 55–65 years old, complex specialist job, medium-sized companies
Excessive working hours	Male, full-time (≥35 h/week), complex specialist job and highly complex job, small businesses

Note(s): Reference Categories: Gender: Male; Employment Relationship: Part-time; Age: 35–44 years; Level of education: Low; Professional Training: Skilled Occupations; Company Size: Small; Economic Sector: Manufacturing
Source(s): Authors' own work

In line with previous studies, it also appears that full-time employees are more often affected by high work intensity than part-time employees, especially by deadline/performance pressure (range: BIBB/BAuA Employment Survey 2018 b = 0.1599, $p \leq 0.001$; DGB Index, 2018 b = 0.0418 and $p \leq 0.01$) and excessive working hours (range: BIBB/BAuA Employment Survey 2018 b = 0.1505, $p \leq 0.001$; EWCS 2015 b = 0.0879 and $p \leq 0.001$) across all data sets. With regard to age, no clear overarching pattern can be identified across all data sets. Furthermore, the results indicate that individuals with higher school-leaving qualifications or higher vocational training are more likely to be affected by high work intensity than lower-skilled employees. This is particularly evident for the work intensity indicators of disruption and multitasking across all datasets.

Regarding the size of the company, it can be stated that employees in medium-sized and large companies report more work intensity than those in small companies. This particularly applies to the indicators "pace of work," "disruptions" and "increase in stress." No clear patterns emerge for the economic sector.

In the second step, six additional regression models were calculated in which further individual and work-related determinants of work intensity were added block by block to the basic model. Due to the large number of determinants tested with four different data sets, it is challenging to present the results of the regression models clearly in a table. To facilitate the overview of the results of the six models, we have opted for a simplified presentation (see Table 3). The summary evaluation of the study results is based on the estimators of the regression models (see Appendix Table II). Positive correlations, i.e. determinants that are associated with increased work intensity, are marked in red. In contrast, the negative correlations are marked green, i.e. for those determinants that are associated with a lower level of work intensity. Negligible correlations, i.e. non-significant and/or very small coefficients, are marked in gray. The respective strength of the correlations was grouped according to the range of the estimated coefficients (coef) and can be broken down as follows: "+": $0.02 \leq$ coef ≤ 0.05; "++": $0.05 <$ coef ≤ 0.09; "+++": $0.1 \leq$ coef ≤ 0.4. In cases where the range of the estimators across the different surveys was very large, the majority results served as a guide. For individual deviating results, such as support from colleagues or compatibility, the results can be taken from the detailed overview files (see Appendix Table II).

First, additional individual characteristics were examined: (1) income and (2) leadership responsibility (Appendix Table II, Section A). The probability of being affected by high work intensity tends to decrease with lower income. As expected, in all surveys, employees with a low income of up to 1,500 euros per month are less likely to work excessive hours than those with a high income of more than 4,000 euros per month. In contrast, leadership responsibility is moderate to strongly associate with high work intensity across all data sets. This is particularly evident for disruptions at work: leaders are up to 25% (EWCS 2015) more likely to be affected by disruptions than non-leaders.

Second, two other company-related characteristics were examined as possible determinants: (1) Is it a public service organization? (2) Does it have a works or staff council? (Appendix Table II, Section B). Both determinants correlate rather weakly or moderately with work intensity dimensions. Employees working in public sector organizations are consistently less likely to work very quickly or under strong deadline and/or performance pressure than employees in private sector organizations. With the exception of the DGB Index, 2018, public sector workers are also less likely to have excessive working hours. The presence of a works and/or staff council is associated with a reduced likelihood of excessive working hours but an increased probability of work intensification.

Third, two determinants from the category working time were included: (1) actual working time and (2) a work-life balance characteristic (compatibility of work and family; Appendix Table II, Section C). The results show that longer working hours and poorer compatibility of work and family are associated with a higher probability of increased work intensity (with the exception of the disruption indicator in the DGB Index, 2018). In particular, working 40 or more hours per week is highly correlated with all work intensity dimensions considered in the analyses.

Table 3. Main models – summary of the individual regression models regarding the relationship between the selected determinants and aspects of work intensity

Determinants		Work intensity indicators					
		Pace of work	Deadline/ Performance pressure	Disruptions	Multitasking	Increase in intensity	Excessive working hours
A Individual characteristics							
	Up to 1,500 euros		++	+++	+++	+	+++
	1,500 to 2,500 euros			+	++		+++
	2,500 to 4,000 euros	+	+		+	+	+++
	More than 4,000 euros	*Reference*					
	Leadership responsibility	++	+++	+++	+++	++	++
B Company characteristics							
	Public service	+	+				+
	Presence of the works council/staff council					++	+
C Working time							
	up to 20 h/week	*Reference*					
	20 to 30 h/week	+	+++	++	++	++	Not included in the model
	30 to 35 h/week	+	+++	+++	+++	+++	
	35 to 40 h/week	+	+++	+++	+++	+++	
	40 to 48 h/week	+++	+++	+++	+++	+++	
	more than 48 h/week	+++	+++	+++	+++	+++	
	Compatibility (not frequent)	+++	+++	++	+	+++	
D Technical requirements							
	Technology	++		+++	+++		+
E Insecurity							
	Temporarily employed		++	+++	++	+++	
	Restructuring	++	+++	+++	++	+++	
	Downsizing	++	++	++		++	+
	Job insecurity	++	+++	++		+++	
F Support							
	Not often: Support from supervisor	+	++	+		++	
	Not often: Praise/recognition from supervisor	++	+++	++	++	+++	
	Not often: Support from colleagues	++	++	+	+	++	+

Note(s): Negligible correlations, i.e., non-significant and/or very small coefficients, are marked in grey. Determinants associated with increased work intensity, are marked in red; Determinants associated with a lower level of work intensity are marked green; Strength of correlations: "+": $0.02 \leq coef \leq 0.05$; "++": $0.05 < coef \leq 0.09$; "+++": $0.1 \leq coef \leq 0.4$
Example: Working with technology shows a moderately strong and negative correlation with a fast pace of work (++, green shaded). In contrast, a strong and positive correlation can be observed between technology and disruptions (+++, red shaded). Working with technology is therefore associated with a slower pace of work, but with more disruptions
Source(s): Authors' own work

In the fourth model, the determinant "working with technology" from the category D) technical work requirements was tested (Appendix Table II, Section D).

The results of the BIBB/BAuA Employment Survey 2018 and the BAuA-Working Time Survey 2015 point to the fact that when using modern ICT such as the internet, e-mail etc., the probability of disruptions and multitasking as well as (to a slightly lesser extent) excessive working hours is higher, whereas the probability of working very fast seems to be smaller for employees working with modern ICT. However, these correlations do not show up in the data set of the EWCS 2015 (with the exception of the variable disruptions) [5].

In the fifth main model, aspects of insecurity were examined: (1) temporary employment, (2) restructuring, (3) downsizing and (4) job insecurity (Appendix Table II, Section E). The determinants considered are predominantly moderately to strongly associated with high work intensity, with the exception of temporary employment. For instance, three data sets show that fixed-term workers are less likely to have a very fast pace of work, deadline and/or performance pressure or disruptions at work. In contrast, restructuring relates to an increased likelihood of high intensity at work, except for excessive working hours. Evidence that job cuts are associated with high work intensity can be found in the BIBB/BAuA Employment Survey 2018 and the BAuA-Working Time Survey 2015. Job insecurity is also associated with high work intensity, for example, via the indicators, namely, deadline and/or performance pressure and disruptions (this association is not found in the EWCS 2015 dataset).

In the final block, determinants from the category of support were examined: (1) support from supervisor, (2) praise and/or recognition from supervisor and (3) support from colleagues (Appendix Table II, Section F). Overall, a higher level of work intensity is found for employees reporting low social support. This becomes particularly evident when examining the role of praise and/or recognition from the supervisor, where the analyses suggest moderate to strong correlations. Employees who are rarely or never given recognition by their supervisor are more likely to report to work quickly, to work under deadline and/or performance pressure or to work longer hours. Furthermore, these respondents more often report work intensification.

Overall, the results show that high work intensity is determined by a variety of determinants. Moderate to strong correlations can be seen in particular with excessive working hours, leadership responsibilities, poor compatibility of work and family, restructuring in the company, job insecurity and little praise and recognition from supervisors.

5. Discussion

The feeling of not having enough time for all the things that need to be done is a common phenomenon in the working world (Green *et al.*, 2022; Rosa, 2005). To gain a competitive advantage, companies are accelerating their production and decision-making processes (Kubicek *et al.*, 2015), leading to greater pressure on employees to work faster and under tighter deadlines (Green, 2004a, b).

Working under a continuously high intensity is a health risk (Beermann *et al.*, 2018; Løkke and Madsen, 2014; Seiler *et al.*, 2013). Therefore, it is crucial to identify the factors for increased work intensity in order to design work appropriately and reduce health risks to workers. Accordingly, our analyses were guided by identifying individual and work-related determinants of high work intensity and work intensification, as well as work extensification. The aim was to provide a systematic overview of determinants of work intensity. Therefore, existing findings on determinants were examined and expanded by investigating determinants that have received less attention so far. The unique feature of this research is the comparative analysis of four representative employee surveys for Germany in order to identify robust relationships between selected determinants of high work intensity and work intensification. The findings show that high work intensity is a multifactorial phenomenon. In the following, we will discuss the results regarding the individual and work-related determinants separately. Thereby, we refer to the factors that are moderate to strongly correlated with work intensity, intensification and extensification (see Tables 2 and 3).

5.1 Individual determinants of work intensity

First, the analyses indicate that women are more frequently affected by high work intensity and work intensification than men, with the exception of excessive working hours. Existing studies indicated a rather mixed picture in this respect (Burchell and Fagan, 2004; Fiksenbaum *et al.*, 2010; Green *et al.*, 2022; Mauno *et al.*, 2019). On the one hand, aspects directly related to work may contribute to higher perceived or actual work intensity among women. Women are disproportionately more likely to work in demanding fields or occupations, such as healthcare, education or service industries. These fields often require working quickly and coordinating multiple activities along with emotional labor (Burchell *et al.*, 2007). Furthermore, discrimination and bias can lead to situations where women are underrepresented in leadership roles or face barriers in their careers, which may require extra effort to succeed (Russell and McGinnity, 2014; Lindley, 2016). On the other hand, unpaid work and the reconciliation of this with gainful employment may be an explanation for the higher work intensity among women. Women often take on a larger share of household and caregiving responsibilities. This can lead to (perceived) higher overall work intensity when combining paid employment and unpaid domestic work. The gender norm and the expectation that women must excel in multiple roles, such as caregiver, parent, and employee, may also explain why men are more likely to work long hours. Early studies indicate that women are more likely than men to use flexible work arrangements to balance paid work and personal life, using them to influence the pace and location of work. Men, on the other hand, tend to use them to work longer hours (Lott, 2015; Lott and Chung, 2016).

Second, full-time employees more often report a high work intensity and work intensification than part-time employees. The majority of studies conclude that working hours and work intensity are correlated. In this context, Piasna (2018) points out that the organization of working time is a relevant factor in this context (e.g. flexibility and control over scheduling). She also makes clear that high work flexibility is associated with more working hours and high work intensity. Based on social exchange theory, it can be assumed that employees respond to the opportunity to work flexibly by making extra efforts to return the benefit to their employer (Kelliher and Anderson, 2010). Another explanation could be the higher job involvement of full-time employees (Thorsteinson, 2003). In turn, a correlation between job involvement and work intensity is discussed (Hogan *et al.*, 2014; McCook, 2002).

Third, employees with a higher socioeconomic status (i.e. education, professional training, income and leadership responsibility) report more often high work intensity and work intensification than employees with lower socioeconomic status. These results are consistent with Burchell and Fagan (2004), Green *et al.* (2018, 2022) and Korunka (2020), among others. Based on the observation that working hours and work intensity are correlated, one explanation lies in the working hours of individuals with higher socioeconomic status. For example, white-collar workers, employees with professional training and managers work full-time more often than the respective comparison groups (Burke *et al.*, 2010; Golden, 2007). Furthermore, the jobs of the aforementioned groups are more often associated with knowledge-based work, which can be mentally demanding. Professionals may need to constantly acquire new skills, stay abreast of industry trends and adapt to changing circumstances, resulting in increased cognitive demands. In addition, there are leadership and decision-making responsibilities. Especially managers are responsible for making critical decisions that affect their teams and organizations. This involves evaluating information, setting priorities and taking action, often under tight deadlines. Decision-making can be mentally taxing and require significant time and effort.

In particular, the stronger effects among employees with higher socioeconomic status indicate that in the future, consideration should be given to expanding the concept of vulnerable groups in relation to quality of work. This concept often refers to those with hazardous working conditions, in precarious employment or with persistently low wages (Le Fevre *et al.*, 2015). Thus, the focus is more on groups with lower socioeconomic status and

blue-collar workers. As described before, however, high work intensity is precisely a challenge in higher social and/or professional positions.

5.2 Work-related determinants of work intensity

The previous remarks have already highlighted that the consideration of underlying mechanisms is highly relevant. In this context, our study shows that especially excessive working hours, poor compatibility of work and family, restructuring in the company, job insecurity and little praise and recognition from superiors are robust determinants of work intensity and work intensification.

The correlation between working hours and work intensity has already been pointed out. The correlation is particularly pronounced for excessive working hours (more than 48 h/week). This is in line with the available empirical evidence regarding the correlation of extensification and intensification of work. Existing research points to this as an employer-oriented solution, where employees work longer hours to accommodate higher workloads and short-term peaks in demand (see Piasna, 2018).

Some studies have also pointed out that increased work intensity and work intensification are associated with a poorer work-life balance (Fuchs, 2007; Shirmohammadi *et al.*, 2022; Yu, 2014). Our results also suggest that a poor compatibility of work and family relate to high work intensity and work intensification. This result can be attributed, among other things, to the items available for measuring compatibility of work and family, which read as follows or similarly: How often do you manage to take your family and private interests into account when planning your working hours? (Rohrbach-Schmidt and Hall, 2020). Thus, the formulation can be a proxy for a lack of successful conditions for reconciliation, which in turn affects the level of work intensity. These can be, for example, employee-oriented working time or compatibility as a strategic goal of the company at the organizational level and the lack of competence of boundary management at the individual level.

Job insecurity and restructuring processes have already been discussed as determinants of high work intensity and intensification. However, evidence on whether job insecurity and restructuring processes are significant determinants of high work intensity is mixed (Gallie, 2002, 2005; Gallie and Zhou, 2013; Green *et al.*, 2022; Kelliher and Anderson, 2010). Differing results may be due to different national contexts (Debus *et al.*, 2012), on the one hand, and to the operationalization of job insecurity and restructuring (Hunt and Pickard, 2022), on the other. Our results robustly show for Germany across four data sets that job insecurity and restructuring processes are correlated with increased work intensity and work intensification. The fear of losing one's job could therefore change the behavior of employees, who then might work more intensively (Hunt and Pickard, 2022). Furthermore, restructuring processes can be accompanied by increased learning requirements, responsibilities or flexibility requirements as well as new management practices (e.g. just-in-time or lean production systems), which in turn lead to increased work intensity (Green *et al.*, 2022).

The analyses also showed that leaders play a central role in work intensity. In this context, leaders are seen not only as a resource in the context of social support but also as important agents in the (co-) design of working conditions (Vincent, 2012). Studies point to the positive effect of social support from the leader on numerous working conditions, including work intensity and well-being at work (Dysvik *et al.*, 2014; Fairris, 2004; Hämmig, 2017). Our results also show that the level of praise and recognition by the supervisor matters for work intensity. This sheds light on another relevant aspect of leadership. Although leaders play a central role for work intensity, there has been little differentiated research on how individual aspects of leadership behavior might relate to work intensity.

Finally, other correlations between determinants and work intensity and work intensification found in the literature, such as technological requirements, temporary employment or public service affiliation, could not robustly be proven for all selected indicators of work intensity with a moderate to strong correlation. Nevertheless, these factors

are relevant for the analysis of the determinants of (dimensions of) work intensity and intensification. Equally, however, it is clear that the operationalization of work intensity can affect the results and that further discussion on the standardization of indicators for measuring work intensity is necessary.

6. Limitations and outlook

Despite the use of large and representative data sets in Germany, some limitations must be taken into account when interpreting the results.

First, due to the cross-sectional surveys and the empirical approach, no causal relationships can be established with work intensity and its determinants, as reverse causality or unobserved heterogeneity cannot be taken into account.

Second, the most important criterion in deciding the determinants was to include indicators that were as comparable as possible. This has led to the reduction of supposedly important indicators, as these determinants were not covered across all datasets. However, taken individually, the different data sets offer the possibility to look at specific aspects of work intensity and its determinants.

Third, work intensity was derived from the subjective reports of the respondents, potentially resulting in an overestimation. However, precisely because of the nature of experienced work intensity, the subjectivity of respondents in the measurement should not be disparaged or criticized. The views of respondents are an important indicator for the objective measurement of work intensity (Kahneman *et al.*, 1999; Rau and Göllner, 2018). Nevertheless, the (further) development of objective indicators and their integration into surveys on the topic of work intensity and work intensification would be a worthy focus for future research. In addition, future research should replicate the present results using a longitudinal study design; however, this would require data that allow for a longitudinal analysis.

It is important to bear in mind that indicators of work intensity can be mutually dependent and also often go hand in hand with an intensification and extensification of working time (e.g. through disruptions at work, deadline and/or performance pressure and excessively long working hours). As a consequence, the distinction between the explanatory factors for work intensity through objective work demands and individual stress consequences called for by Roe and Zijlstra (2000) does not always have to be clear-cut, especially in modern, complex and dynamic working environments. Both can influence each other. This can be assumed especially in the context of changed forms of work organization, for e.g. in the context of self-organization, subjectivization of work goals, self-responsible and result-oriented work (Sauer, 2005). This holds for these contexts as they are accompanied by high demands on the employees' individual levels of self-control and employees consequently put themselves under pressure in the course of an "interested self-endangerment" (Krause *et al.*, 2012).

In summary, this study shows – across several data sets – robust empirical correlations with individual characteristics (such as a slightly stronger impact on full-time employees with higher qualifications and higher income), as well as with work-related determinants (restructuring in the company, poor leadership competence, poor compatibility of work and family and excessive working hours). Further research on the determinants of work intensity is particularly needed at the intersection of paid and unpaid work. Especially for the understanding of gender-specific results, this could make a valuable contribution. Furthermore, in this context, studying boundary management competences of employees as a resource to reduce work intensity is important. Also, work designs that reduce work intensity could be further investigated through intervention studies in companies, as they can better capture the complexity of organizations (Kelloway *et al.*, 2008).

In workplace reality, the level of work intensity is a highly relevant issue for work design and occupational health and safety in Germany. The analyses indicate that specific groups of employees must be given special consideration in this context (e.g. women, full-time employees and employees with a higher socioeconomic status). In general, supervisors should design work tasks, performance expectations and the work environment in a way that they can

be managed in the available working time. Good company working time regulations, including periods of inaccessibility, make an important contribution to preventative health (e.g. Mellner, 2016). Here, supervisors are generally important agents in the (co-)design of working conditions (Vincent, 2012). The results indicate that supervisors should regularly give employees adequate and constructive feedback on their work performance to date. It is also important to let employees know that they can ask for social support from superiors or colleagues if necessary. In this context, the level of work intensity should also be taken into account in the legally required risk assessments. The results of this work thus make a contribution to the design of good and healthy working environments.

Based on our findings and in line with Virtanen *et al.* (2011), we further suggest that reducing job insecurity should be a central goal in organizations to improve the level of work intensity of employees. The literature review by Köper and Gerstenberg (2016) summarizes recommendations relevant to practice on how to mitigate potentially adverse effects of job insecurity. They differentiate measures for dealing with job insecurity at three levels, namely the strategic, operational and individual levels. Many of the suggestions for improvement also address organizational restructuring as another important determinant of high work intensity. In addition to condition-related design recommendations, person-related ones are also important. For example, training courses can be used to teach employees how to deal with or reduce high work intensity (Stab and Schulz-Dadaczynski, 2017).

Notes

1. For an overview of all available determinants in the employment surveys see Hünefeld *et al.* (2021).
2. For the ease of interpretation, we perform OLS regression analyses with robust standard errors. Since linear and logistic models often yield similar results, we prefer this model as this interpretation is more intuitive and better fits the research questions under investigation than the interpretation of, for example, odds ratios from logistic regressions. To compensate for the violation of homoscedasticity, heteroscedasticity consistent robust standard errors are used.
3. The decisive factor here was that the BIBB/BAuA Employment Survey and the BAuA-Working Time Surveys only have employed persons with at least 10 working hours per week in their samples and the DGB Index only has dependent employees.
4. For a detailed overview of the sample characteristics, see Hünefeld *et al.* (2021).
5. The item on technology was not included in the DGB Index, 2018.

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Supplementary material

The supplementary material for this article can be found online.

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