

MASTER THESIS



# Living to work or working to live? – The effects of shift work schedules on work-life balance in the public healthcare

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### Acknowledgement

Coming from the hospitality background, I have found my passion for the work in Human Resources during an internship at a hotel. Now, in retrospective, I am glad that the difficult situation of the year 2020 has pushed me to go after (what was Plan B): the master's degree in HRM. And I cannot stress enough how glad I am to have made this decision. The past one and a half years (including the pre-master) have taught me important lessons. Just after starting the master, I was approached by the company 'HpH', more specifically Mr. Pieper, if I would be interested in writing a research project about shift working schedules and how they affect the employee's satisfaction and work-life balance.

Thank you to my supervisors and colleagues at the company 'HpH' who have made this research possible and as interesting as it came out to be. Investigating this specific topic was much more than just a research thesis. Thank you for your endless trust in my work.

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Enjoy the read!

Enschede, January 2022  
– Wiebke Spekker

### Abstract

**Background** – With the current shortage of specialized employees in the area of public healthcare, the retention of employees has become increasingly important. Different factors of shift work impact the satisfaction and work-life balance of employees in this sector, where a large amount is rather unsatisfied with their work-life balance due to unpredictable and rather flexible shift work schedules. Therefore, the focus will be on shift work schedules.

**Problem** – The main question of this research is “What effects do shift work schedules have on work-life balance of employees in the public healthcare sector?”.

**Method** – A combination of a satisfaction survey and Sustainable Employability tool (by ‘ModernWorkX’) analysis was used to analyse the effect of shift work schedules on work-life balance of the employees at the German public healthcare company ‘Heilpädagogische Hilfe Bersenbrück’. Hierarchical linear regression analyses based on a sample of 79 respondents was used to analyse the effect of subjective and objective shift work schedule satisfaction on the work-life balance of the employees.

**Outcomes** – Main findings include that there is a significant effect of “length and intensity of working hours”, “social aspects of working hours” and “Worktime Control” on the Work-Life Balance of employees. The combination of both survey and SE tool data/ methods (Regression Model 4, Adjusted  $R^2= 44.6 \%$ , Sig.=  $<.05$ ) includes four significant predictors of WLB: Length & intensity of working hours, social aspects of working hours, Worktime Control, Strain of working schedules and the control variable Gender. The explained variance was higher for the regression model including satisfaction variables (subjective data) rather than objective data from the Sustainable Employability tool.

**Implications/ Applications** – Practical implications include advice to the management and HR department of the organization in regard to reframing the shift planning to a (fixed forward) rotation schedule as well as the company’s health management to enable a better work-life balance for their employees. Lastly, the company should re-analyse the situation within the institutions after these changes were implemented. Theoretical implications include the significant findings of this new method of predicting the work-life balance of employees (combination of SE tool and satisfaction survey).

**Key words** – Work-Life Balance, Shift work, Shift work schedules, Public healthcare in Germany, Length and intensity of working hours, Social aspects of working hours, Worktime Control

## Table of Content

1 – Introduction .....	6
2 – Theoretical framework .....	9
2.1 Work-Life Balance (WLB).....	9
2.1.1 Definition Work-Life Balance .....	9
2.1.2 Factors of WLB.....	9
2.2 Shift work & schedules.....	10
2.2.1 Definition Shift work.....	10
2.2.2 Different shift work schedules in public healthcare.....	10
2.2.3 General effect of shift work on employees .....	11
2.2.4 Effect of shift work on WLB.....	11
2.2.5 Factors influencing shift work schedules in public health care .....	12
2.2.6 The public healthcare sector in Germany .....	15
2.2.7 German Public Labour Law (TVöD).....	15
2.3 Research model.....	16
3 – Method .....	18
3.1 Research design.....	18
3.2 Data collection .....	18
3.2.1 Procedure.....	18
3.2.2 Research context .....	19
3.3 Measurement.....	20
3.3.1 Dependent Variable: Work-Life Balance .....	20
3.3.2 Independent Variables: Shift work .....	21
3.3.3 Control Variables .....	22
3.4 Data analysis .....	24
3.4.1 Analysis of survey data.....	24
3.4.2 Analysis of tool output .....	24
3.4.3 Comparison .....	25
3.4.4 Trustworthiness of the research.....	25
4 – Results .....	26
4.1 Demographic variables .....	26
4.2 Correlation table .....	27
4.3. Hierarchical Linear Regression analysis .....	29
5 – Discussion.....	33
5.1 Key findings .....	33
5.2 Theoretical implications.....	33
5.2.1 Work-Life Balance .....	33
5.2.2 Satisfaction with length & intensity of working hours.....	34
5.2.3 Satisfaction with variability of start and ending times .....	34
5.2.4 Satisfaction with social aspects of working hours .....	34
5.2.5 Worktime Control (WTC) .....	35
5.2.6 Strain of working schedules (as captured by SE tool) .....	35
5.2.7 Findings based on combination of all variables (Regression Model 4).....	36
5.3 Practical implications .....	36
5.3.1 How to prevent a negative effect of shift work schedule aspects on WLB.....	36
5.3.2 Improvements for shift work schedules.....	37
5.3.3 Concrete advice to the organization .....	38
5.4 Limitations & suggestions for further research .....	39
5.4.1 Limitations .....	39

5.4.2 Suggestions for further research.....	39
6 – Conclusion .....	40
References.....	41
Appendices .....	47
Appendix 1 – Definitions of Work-Life Balance.....	47
Appendix 2 – Categorization of WLB .....	48
Appendix 3 – Review of current literature on effect of shift work schedules on WLB.....	49
Appendix 4 – Factors influencing shift work schedules (literature review) .....	52
Appendix 5 – Main variables of shift work schedules (Härmä et al., 2015) .....	53
Appendix 6 – Laws about shift work based on ‘TVöD’ (Effertz, 2021) .....	54
Appendix 7 – Survey.....	55
Appendix 8 – Conversation Notes ‘HpH’ .....	58
Appendix 8.1 – Conversation Note 1 – Management ,Living & Care’ .....	58
Appendix 8.2 – Conversation Note 2 – HR-Controlling .....	59
Appendix 8.3 – Conversation Note 3 – Visit to ‘Haus am Bokeler Bach’ .....	60
Appendix 8.4 – Conversation Note 4 – Visit to ‘Neurologisches Pflegezentrum/ NPZ’ ...	63
Appendix 8.5 – Conversation Note 5 – Visit to ,Haus an der Möhringsburg’ .....	64
Appendix 8.6 – Conversation Note 6 – HR Training/ Development/Recruiting.....	65
Appendix 8.7 – Conversation Note 7 – Visit to ‘Haus Quadenort’ .....	66
Appendix 9 – Company structure ‘HpH’ .....	67
Appendix 10 – Information on Sustainable Employability tool by ModernWorkx.....	68
Appendix 11 – WTC Access Scale (by Nijp, 2016).....	69
Appendix 12 – Results from SE tool.....	70

### List of Tables

Table 1: Theories of Work-Life Balance.....	9
Table 2: Definitions according to the Working Hours Act (‘Arbeitszeitgesetz’).....	16
Table 3: Hypotheses for this research .....	16
Table 4: Overview of items included in variables .....	21
Table 5: Demographic characteristics.....	26
Table 6: Mean, Standard Deviation, Skewness & Kurtosis of variables .....	27
Table 7: Correlation Table .....	28
Table 8: Results of regression analysis, with work-life balance as dependent variable.....	30
Table 9: Answers to Hypotheses .....	31
Table 10: Concrete advice to management .....	38

### Table of Figures

Figure 1: Research Model .....	17
Figure 2: Data collection procedure .....	19
Figure 3: New research model based on confirmed findings.....	32

## 1 – Introduction

With the current shortage of employees in the German public healthcare sector (OECD, 2019), it is of special importance to retain (and attract) employees. How this can be achieved with the help of designing shift working schedules to coincide with a good work-life balance of the employees, is the focus in this research.

The general **shortage of employees in public healthcare** has been increasing in the past years and in a special focus during the current CoVid-19 pandemic. Statistics about the German healthcare sector show that the percentage of nurses has decreased in the last 20 years where “the shortage of health care personnel is an important health system challenge” (OECD, 2019, p. 11). The problem is that general plans to attract more employees into the field of healthcare are still missing nationwide (OECD, 2019). This shortage makes each employee and their **retention** even more important “to ensure the presence of necessary skilled workers who can secure the quality and quantity of the goods or services they provide, and who can maintain their competitive advantage” (Kyndt et al., 2009, p. 196). An important factor for employee retention is a good work-life balance as research shows (Deery & Jago, 2015; Kyndt et al., 2009).

Scholars have defined **work-life balance (WLB)** in many different ways. It can be seen as “an individual’s ability to meet their work and family commitments, as well as other non-work responsibilities and activities” (Delecta, 2011, p. 186) or as “the extent to which an individual is equally engaged in—and equally satisfied with—his or her work role and family role” (Greenhaus et al., 2003, p. 513). Summarizing, work-life balance entails the chance and challenge of balancing work and non-work responsibilities and commitments and for work to have as less social and physical impact on the well-being of employees as possible. The concept of WLB is arguably important in any sector and for every employee but especially important for employees with non-normal working times. The spill-over, compensation and work/family border theories have underlined the importance of these blurred lines between the work and family context and how employees can be affected by a potential work-life imbalance. Studies have shown that a good WLB can have several different benefits such as commitment, productivity and lower turnover of employees and in general lesser challenges between employees (Albertsen et al., 2014; Lockwood, 2003). In return, a conflict between work and private life can have several consequences, such as an impact on “health and well-being of the employees as well as for absence, turnover intentions and commitment to the organization” (Albertsen et al., 2014). A review of the topic (Eby et al., 2005) has shown that low levels of WLB are more likely when employees have children and/or a separate private conflict at home. Even though it seems evident, that a good work-life balance and as less conflict in WLB is necessary in an organization, these consequences should sufficiently undermine any doubts regarding the importance of the topic. Based on these potential consequences of a conflict in WLB and the impact shift work could potentially have on this, the concept of WLB was chosen as one focus of this research. Since shift work is common in public healthcare and could be having a negative effect on the WLB of employees, this aspect was chosen as the second focus.

**Shift work** can be defined as “an ambiguous term that refers to a wide range of work hour arrangements involving two or more teams (shifts) that differ in terms of the starting and finishing times of their work” (Sallinen & Kecklund, 2010, p. 121). Different authors agree that there are several factors which can be used to describe the shift work design such as: the maximum number of consecutive shifts, direction and speed of shift rotation, sequence of shifts, duration of shift/ length of the working hours, time off between shifts, start and end times of shifts, shift intensity, social aspects of working hours, and weekend and night shifts

(Åkerstedt, 2003; Härmä et al., 2015; Klein Hesselink et al., 2010; Knauth & Hornberger, 2003; Sallinen & Kecklund, 2010). Shift work design can have different impacts on employees such as impaired ability to sleep and fatigue (Åkerstedt, 2003; Åkerstedt et al., 2002), health problems (Knauth & Hornberger, 2003), “considerable disruption of family and social activities” and even “social marginalisation” (Harrington, 2001, p. 69). Other effects of shift work include a negative impact on mental and physical health of employees, performance and a higher chance for accidents at work and/ or after shifts (Harrington, 2001). All these effects of shift work on employees can have an impact on the work-life balance of these employees. Worktime Control (WTC) describes how much perceived control employees have on their working times. WTC also arguably, impacts the WLB of employees as one factor of shift work schedules.

Studies have tried to measure different aspects of shift work and working schedules and their **impact on employees** but a complete measure of its impact on work-life balance is yet to be found (Albertsen et al., 2008; Iskra-Golec et al., 2017; Van Amelsvoort et al., 2004; Williams, 2008; Wirtz et al., 2011; Wöhrmann et al., 2020). A possible, arguably suitable, measure for the impact of shift work schedules on WLB of employees is the Sustainable Employability tool (referred to as ‘SE tool’) by the company ‘ModernWorkx’. The tool indicates how much physical (health) and social (WLB) risk an employee faces with the special shift work plan they are working. This tool was chosen as one of the two methods (next to a survey) for this research.

Based on this situation and complication, a clear **research gap** can be identified where the concrete and combined factors which influence the perception of shift work (schedules) and work-life balance are not yet measured in one measure but in several very complex surveys and indices. To create a better insight into which aspects of shift work schedules impact the WLB of employees, such a measure could be useful. How this combined subjective and objective effect can be measured, and which factors should be included in calculations will provide a more complete view on the effect of shift work schedules on work-life balance. There have been attempts to capture the effect within one number (de Leede, 2019). The objective outcomes (e.g., number of night shifts) of this tool will be compared with subjective perceptions of employees about shift work, WLB and their satisfaction with both, to enhance the tool and find a more complete possibility to capture the effect mentioned before. According to Iskra-Golec et al. (2017), there is a clear need for more studies on the topic of work-life balance of shift workers. They found a negative effect of shift work on several aspects (e.g., marital communication, consideration of shift wishes, childcare) on the WLB of employees. Additionally, Holly and Mohnen (2012) underline the importance of research into working hours and WLB for companies and their HR principles.

The **research goal** of this master thesis is to gain insights into the effect of different shift work schedule aspects on the work-life balance of employees in the public healthcare sector. This includes aiming to capture the complete effect (both subjective and objective) of shift work schedule aspects on WLB of employees. The findings of this study could be used to enhance the effect in order to retain and attract employees, which are difficult to find in the public healthcare sector.

The **central Research Question**, which will be answered with a study at a company ‘HpH’ and a quantitative survey as well as the analysis of the before-mentioned SE tool, is:

***“What effects do shift work schedules have on work-life balance of employees in the public healthcare sector?”***

The company '**Heilpädagogische Hilfe Bersenbrück**' (short: 'HpH') was used as a setting and company to analyse the research question. The 'HpH' focusses on the employment and care of disabled persons in different kinds of establishments in the region of Osnabrück in Germany (HpH-BsB, 2021). It operates in the public healthcare sector according to the German Public Labour Law (German: *Tarifvertrag des öffentlichen Dienstes*, short: *TVöD*). The company has voiced their interest in research in the direction of shift work design and its influence on work-life balance of their employees. The WLB at the company includes different benefits for employees which have an impact on employee's work-life balance, such as flexible part-time options, pension plans, trainings, employees satisfaction surveys, performance-related pay, as well as fitness options for a reduced rate (HpH-BsB (2021)).

The **theoretical contribution** includes new insights into how shift work influences WLB in the public healthcare sector. The research provides new connections as to which aspects of shift work seem to satisfy employees the most and the correlation to WLB enhances general knowledge on the research area. These results are of special value for the academic fields of human resource management (HRM), occupational health and safety, public healthcare studies, and employee well-being, where the certain significant aspects of shift work schedules will lead to new insights, adding onto 'spill-over theory' (Staines, 1980), 'compensation theory' (Staines, 1980) as well as the 'work/family border theory' (Clark, 2000).

Additionally, to the theoretical contribution to literature, this research also contributes methodologically. The **methodological contribution** includes a new way to measure the link between shift work and work-life balance based on previous studies, an existing tool, and new insights into the perceptions of employees. The mix between these two methods, combined, provides a more extensive overview of the impact of shift schedules on WLB.

The **practical contribution** of this research consists of value for the company 'HpH' as well as for the company 'ModernWorkx' and for the general public healthcare sector. The companies can gain new insights on how to improve the WLB of employees (in order to retain and attract employees), the SE tool and survey can be used to assess important factors and give recommendations. But it was also possible to gain knowledge about what the employees think. The outcome for the company 'HpH' is clear recommendations on what to change regarding time schedule of employees. For 'ModernWorkx' recommendations on how the SE tool can be used and what its limitations might be, are given. This SE tool can be of value for the whole sector if outcomes are precise enough and companies such as the 'HpH' can benefit from them to increase WLB of their employees. As the company is highly family-focused (HpH-BsB, 2021), this value is of special importance to them and especially relevant in the current Covid-19 pandemic, where the public healthcare sector and the shortage or specialised personnel has become more important than before.

The **outline of this master thesis** can be summarized as the following. First, the situation and complication as well as definition of key variables will be given. Furthermore, the method of the research is described, where a survey was conducted at the company 'HpH'. Data about shift work schedules of employees was gathered and added into the SE tool to assess the objective risk regarding WLB of the employees. Additionally, the differences in outcomes between the survey responses (subjective) and the tool (objective) were assessed to see how the outcomes of the tool relate to the actual perception of the employees. Then, the outcomes of the survey and tool are analysed and compared, recommendations, possible limitations and ideas for further research will be given. Finally, practical advice to the company 'HpH' and the general public healthcare sector will be given.



## 2 – Theoretical framework

### 2.1 Work-Life Balance (WLB)

#### 2.1.1 Definition Work-Life Balance

The concept of WLB is arguably important in any sector and for every employee but especially important for employees working in shifts. The definition of the term Work-Life Balance, or WLB, can be quite distinctive and since all kind of factors can play a role in WLB, it is difficult to provide an exhaustive definition of the concept: “While some adopt the philosophy of ‘working to live’ and sees work as an objective, others consider ‘living to work’ and situated work into the centre of life” (Delecta, 2011, p. 187). Different definitions can be found in the table in *Appendix 1*. The predominant definition of work-life balance or work-family balance, as some authors call it, is the definition by Clark (2000). She defines WLB as “satisfaction and good functioning at work and at home with a minimum of role conflict” (Clark, 2000, p. 751) while others focus more on the multiple roles a person has (work role and non-work role) where a balance is needed to keep them satisfied (Kalliath & Brough, 2008). Based on these different definitions WLB is defined (for the frame of this research) as the chance and challenge of balancing work and non-work responsibilities and commitments and for work to have as less social and physical impact on the well-being of employees as possible. A good WLB was shown to increase commitment, productivity and to lower turnover rates (Albertsen et al., 2014; Lockwood, 2003). The negative consequences (Albertsen et al., 2014) of a low level of WLB underline the importance of this concept as the main variable of this research.

Several studies have established different theories to capture the concept of WLB over the last 40-50 years. Here, literature mentions theories such as the ‘spill-over theory’ (Staines, 1980) or the ‘compensation theory’ (Staines, 1980) as well as the ‘work/family border theory’ (Clark, 2000). These theories will later support the hypotheses about the expected effect of shift work on WLB. An overview of the theories about WLB can be found in *Table 1* below.

*Table 1: Theories of Work-Life Balance*

<b>Theory</b>	<b>Explanation &amp; Critique</b>	<b>Key takeaways</b>
Spill-over theory (Clark, 2000; Staines, 1980)	‘open systems’ theory “in spite of physical and temporal boundaries between work and family, emotions and behaviours on one sphere would carry over to the other” (p.749)	“Work and family life influence each other, and so employers, societies and individuals cannot ignore one sphere without potential peril to the other” (p.749)
Compensation theory (Clark, 2000; Staines, 1980)	Complementary to spill-over theory “an inverse relationship exists between work and family such that people make differing investments in each in an attempt to make up for what one is missing in the other” (p.749)	Critique: miss key point of balance – relationship between work and family and how its molded by individuals themselves
Work/Family Border theory (Clark, 2000)	“theory that explains how individuals manage and negotiate the work and family spheres and the borders between them in order to attain balance” (p.750)	Propositions and key points of theory in Table 1 of (Clark, 2000, p. 765)

#### 2.1.2 Factors of WLB

Several factors of WLB play an important role when defining the concept of WLB where the determinants of WLB can be divided into the categories of “individual, family, work & organisation and the social environment” (Delecta, 2011, p. 187). Other research names

specific variables which influence WLB, such as gender, age, marital status, children, worked hours, work involvement, met promises and organisational support (Sturges & Guest, 2004). These variables are seen as suitable potential control variables. Alternatively, WLB can be divided into components such as “time balance, involvement balance and satisfaction balance” (Greenhaus et al., 2003, p. 513). Wöhrmann et al. (2020) state that literature generally identifies three forms of work-family conflict: (1) time-based conflicts, (2) strain-based conflicts and (3) behaviour-based conflicts. For the frame of this research, the divisions by Greenhaus et al. (2003) and Wöhrmann et al. (2020) will be combined, meaning that WLB will be divided into (1) time balance and conflict, (2) involvement balance and strain-based conflict and (3) satisfaction balance and behaviour-based conflict. An overview of this can be found in *Appendix 2*. Lastly, research (Kamphuis, 2018) has found that employees were more absent from work if they experience a higher work-life conflict.

## 2.2 Shift work & schedules

### 2.2.1 Definition Shift work

Shift work and shift work schedules can be quite divergent in different industries and sectors, always depending on the requirements and rules and regulations which might be given or necessary. In regards to shift work, authors mention that it is difficult to conceptualise shift work as “in practice, shift schedules are very heterogenous and come with different characteristics” (Wöhrmann et al., 2020, p. 3). These characteristics or factors which influence the different shift work schedules will be discussed below. For now, the definition by Sallinen and Kecklund (2010) will be used to define shift work in the frame of this research where it is “an ambiguous term that refers to a wide range of work hour arrangements involving two or more teams (shifts) that differ in terms of the starting and finishing times of their work” (Sallinen & Kecklund, 2010, p. 121). Although the author acknowledges that there can be many ways to define the term of shift work, this definition is seen as the most appropriate for this research as it includes the wide span and complexity of the concept.

### 2.2.2 Different shift work schedules in public healthcare

In the public healthcare sector, different shift work schedules are used. Sometimes, the schedules are so irregular that they are difficult to define and categorize into one type of shift schedule but sometimes the schedules are quite transparent to understand and strictly organized with the same order of shifts, the so-called rotation of shifts. Sallinen and Kecklund (2010) define different kinds of shift systems where the regular and irregular 3-shift system, 2-shift systems, permanent night work and shift systems during extended operations are mentioned. In healthcare the most used shift systems are 2-shift systems and permanent night work where the employees can be divided into those working day shifts (rotating between morning and evening shifts) and those working night shifts. The different criteria for each shift system were reviewed and can be found in the study of Sallinen and Kecklund (2010). Additionally, “shift systems can be distinguished by the direction of shift rotation involved when the worker changes from one block of shifts to the next” (Tucker et al., 2000, p. 678), meaning that not only the amount of shifts is important but also the order (rotation) of the shifts. Here it needs to be mentioned that within the public healthcare, it is not common to work with a continuously rotating shift schedule. But these shift rotations can still be considered with irregular schedules (Klein Hesselink et al., 2010). Rotation schedules which are rather fixed and are applied on groups of employees, are called ‘collective schedules’ and flexible schedules which focus on individual needs are ‘individual schedules’ (Knauth, 1993).

### 2.2.3 General effect of shift work on employees

Generally, the effect of shift work on employees is arguably more a negative effect than a positive one. Different authors (Åkerstedt, 2003; Folkard & Tucker, 2003; Harrington, 2001; Sallinen & Kecklund, 2010) elaborate on several aspects which are affected, such as social life, physical and mental health, and fatigue. Since all these aspects play an important role in the research of the effect of shift work schedules on WLB, they will be discussed separately here. It should be noted that this overview cannot be completely exhaustive, because of the complexity of the topic. It was shown that shift work affects the family and social life of employees, as the possibilities to participate in family and social activities (e.g. sporting or religious events) is limited which is why “shift work can lead to social marginalisation” (Harrington, 2001, p. 69). Other authors describe this by stating that, less sleep because of shift work can lead to an impact on the free-time of employees (Åkerstedt, 2003) or to a “disturbed social life” (Folkard & Tucker, 2003, p. 99). Even though the negative impact seems to be more present, where marital and child-related responsibilities are affected, shift work can also provide opportunities for more flexible appointment planning (Harrington, 2001).

The effect of shift work on the health of employees plays an important role, as scholars have found that shift work can lead to “impaired health” (Folkard & Tucker, 2003, p. 99), as well as a decrease in the quality and quantity of sleep (Åkerstedt, 2003; Folkard & Tucker, 2003; Harrington, 2001; Sallinen & Kecklund, 2010) and fatigue (Harrington, 2001; Sallinen & Kecklund, 2010). Shift work was also found to increase mental illnesses such as anxiety or depression, cardiovascular and gastrointestinal illnesses and risk in pregnancy (Åkerstedt et al., 2002; Harrington, 2001). Folkard and Tucker (2003, p. 99) state that shift work cause “disrupted circadian rhythms”. Lastly, factors such as gender also impact the effect of shift work on employees. An increased risk of shift work for women compared to men was found by Åkerstedt et al. (2002). They explain that women seem to be impacted greater by inflexible working schedules than men. Flexible work schedules were found to have a positive effect on “productivity, job satisfaction, and work schedule satisfaction” (Eby et al., 2005), making employees more satisfied when having more flexible schedules as more private needs can be considered as well.

Regarding shift work schedules, one needs to consider that there might be a difference between the objective and perceived schedules. Objective schedules are the schedules of the workers which can be viewed with objective data such as how the employees were planned to work and how they actually worked. But shift schedules can also be viewed as perceived schedules where a 12-hour shift or weekend/ night shifts might be harder on some employees than on others. Here, different kinds of justice or perceived fairness of the scheduling was divided into (1) distributional justice, (2) procedural justice, (3) informational justice and, (4) interpersonal justice (Uhde et al., 2020). These different kinds of justice include the subjective fairness of the process, procedures and a respectful communication and culture. Based on these types of justice/perceived fairness, it can be concluded that it is “important to not only consider the objective quality of the resulting shift schedule (i.e. from the economic or legal point of view), but also the subjective experiences of the people involved”(Uhde et al., 2020, p. 10). This basis will be considered later (in the data collection and method) where not only the ‘facts’ of the shift work schedules are analysed but also the perception of the employees regarding their schedules.

### 2.2.4 Effect of shift work on WLB

Several systematic literature reviews on the topic of shift work and WLB were found and can be used. Examples of these reviews (Albertsen et al., 2008; Eby et al., 2005; Iskra-Golec et al., 2017; Van Amelsvoort et al., 2004; Williams, 2008; Wirtz et al., 2011; Wöhrmann

et al., 2020) have been analysed (see *Appendix 3*) and provide a, for the frame of this research, good overview of the current state of research. The complexity of this research still calls for more research since the research is not about shift work per se but about some aspects of shift work (e.g., length and intensity of working hours), so the perception of the employee on each of these is important. This was not captured by existing reviews so far.

Research such as Van Amelsvoort et al. (2004) has underlined the importance and complexity of research on shift work and WLB and state that the “interplay of working hours and work–life balance remains important for companies and their human resource policies” (Holly & Mohnen, 2012, p. 2). According to Iskra-Golec et al. (2017), there is a clear need for more studies on the topic of work-family relationships of shift workers. They found a negative effect of shift work on several aspects such as marital communication but also declare that a positive effect of shift work can be found, for example in the consideration of shift wishes and for childcare when shift schedules of both parents are complementary. The study of Williams (2008) assesses the impact of work schedules and variables on WLB. This research defined shift work with the amount of regular evening/ night schedules, rotating shifts, split shifts, on call or casual, and irregular shifts. The concept of WLB was defined as being a “self-perceived notion” and conclusions of the study include that the satisfaction with WLB is related to shift schedules “but also to a complex interaction of hours worked, self-perception and general feelings of well-being” (p. 15). Since this study took place in Canada in 2008, the question is if the results would show a negative effect in the German context in 2021 as well.

The study of Wöhrmann et al. (2020) provides an overview of the current research on (1) shift work, (2) work-family conflict and (3) effect of shift work on work-family conflict. This review was conducted in 2020 (one year ago) and therefore shows more recent results than other reviews from earlier years such as Albertsen et al. (2008); Van Amelsvoort et al. (2004) or Williams (2008).

The potential unpredictability of shift work is naturally difficult to combine with a good work-life balance (Wöhrmann et al., 2020). The effect of shift work on work-family conflict was reviewed and, as commonly expected, irregular and shift works schedules can have a negative impact on the social and family life of employees and the literature suggests that there is a significant relationship of shift work with work-family conflict but rather not with family-work conflict (Wöhrmann et al., 2020). More studies elaborate on the negative effect of shift work on WLB of employees, where strong effects are found for low levels of WLB when working hours are high (Albertsen et al., 2014; Albertsen et al., 2008; Arlinghaus & Nachreiner, 2016; Dall’Ora et al., 2016; Greubel et al., 2016), or when employees are working on Sundays (Wirtz et al., 2011). Employees working in shift work schedules seem to complain about not having enough time for children and the household as well (Eby et al., 2005).

### 2.2.5 Factors influencing shift work schedules in public health care

Several factors have been identified by scholars which should be considered in combination to assess the shift work system in public healthcare. A more extensive, but not completely exhaustive, overview of factors influencing shift work schedules was developed based on several studies and can be found in *Appendix 4*. For this table, all mentioned influences and factors of shift work were listed based on the studies they were stated in. Aspects such as “number of successive night shifts, the length of the night shifts and the provision of breaks within them” (Folkard & Tucker, 2003, p. 99) need to be considered to assess the risk of the shift system. Other factors, as mentioned before, include the maximum number of consecutive shifts, direction and speed of shift rotation, sequence of shifts, duration of shift, time off between shifts, start and end times of shifts, and weekend and night shifts

(Åkerstedt, 2003; Klein Hesselink et al., 2010; Knauth & Hornberger, 2003; Sallinen & Kecklund, 2010; Wöhrmann et al., 2020).

From this overview it can be seen, that the study by Härmä et al. (2015) arguably provides the most extensive review of factors, which is why the variables were used as variables for this research. Härmä et al. (2015) list 29 variables in total which are said to characterize the dimensions of working time patterns (see article itself or *Appendix 5*), which are length and intensity of working hours, variability of start and ending times, and social aspects of working hours.

### **Length and intensity of working hours**

The length and intensity of working hours includes the main parts of length of working hours and intensity of working hours. The length of working hours in shift work can vary between 1 until 12 hours per shift where most shifts are between 7-9 hours long. The shift intensity was defined based on the number of shifts in a row and how many days the employee has as recovery between these rows of shifts. From the research of Härmä et al. (2015), indicators of this variable are defined as (a) weekly working hours, (b) shift length in hours, (c) percentage of long shifts, (d) length of night shifts in hours, and (e) percentage of long night shifts. Indicators of shift intensity are (a) amount of consecutive shifts, and (b) recovery periods between shifts. This variable basically indicates how many hours an employee works, how often more hours than planned are worked and how intense this work is for the employees. The conceptualisation of each variable can be found in *Appendix 5*.

Based on literature, a negative effect is expected, where the Compensation theory of WLB argues that “work and family life influence each other, and so employers, societies and individuals cannot ignore one sphere without potential peril to the other” (Clark, 2000, p. 749). They state that it is important to have a balance between both areas where long working hours can have a negative effect. Additionally, the author expects a negative effect on the employees’ work-life balance when employees work a high number of shifts in a row and have less recovery periods between these rows. The so-called “Spill-Over theory” was constructed by Staines (1980). It declares that “in spite of physical and temporal boundaries between work and family, emotions and behaviours on one sphere would carry over to the other” (Clark, 2000, p. 749). This indicates that the intertwined areas of work and family life are affected by factors such as amount of consecutive shifts and recovery periods between shifts. According to the Effort-Recovery Theory (Meijman & Mulder, 2013), enough recovery time is necessary to a good work-life balance. This concludes in the following hypothesis.

*H1: The satisfaction with length and intensity of working hours positively affects work-life balance.*

### **Variability of start and ending times**

The starting and ending times of shifts can range from every hour of the day to this time plus the length of the shift. When a shift starts very early, the employee (normally) also finishes their shift earlier than when starting later, which is why the regular starting times will be considered here. How regular or irregular these starting and ending times are, is summarized under this variable (and this is what is meant by ‘variability’) where the indicators of (a) early morning shifts (start earlier than 6am), (b) morning shifts (start between 6am and 9am), (c) day shifts (start between 9am and 2pm), (d) evening shifts (start between 2pm and 6pm) and (e) night shifts (start between 6pm and 12am) are specified. Härmä et al. (2015) name these indicators as varying aspects of the variability of the start and ending times of shift schedules. With changing starting and ending times of shifts, balancing work and private life becomes

increasingly difficult. This is also supported by the Compensation theory as employees have less time to plan for private events and family time (Clark, 2000). From this, the following hypothesis can be defined.

*H2: The satisfaction with variability of shift start and ending times positively affects work-life balance.*

### **Social aspects of working hours**

Finally, the research by Härmä et al. (2015) identified several indicators which describe the social aspects of working hours. Indicators include (a) annual leave days, (b) weekend work, (c) single free days, and (d) shift wishes. Here, the author expects that not having a lot of free days in a year, working on the weekends, having individual free days instead of in a row, and not having the possibility to voice wishes for their shift schedule will negatively affect the WLB of employees. This can be supported with the help of the Work/Family Border theory which states that the degree of commitment to each of family or the work domain plays a central role of the theory and a supportive communication between the two areas of work and family can positively influence WLB, or the opposite effect can negatively influence WLB (Clark, 2000). Based on this, the next hypothesis was defined.

*H3: The satisfaction with social aspects of working hours positively affects the work-life balance.*

### **Worktime Control Access**

Worktime control (WTC) can be defined as “an employee’s possibilities of control over the duration, position, and distribution of worktime, i.e., autonomy with regard to worktime” (Ala-Mursula, 2006, p. 18). According to Nijp et al. (2012) “Worktime control (WTC) has been suggested as a means to reduce employees’ work-home interference and fatigue, and to improve job motivation” which makes it a valuable addition for this research. The degree to which employees perceive to have control over their working time can therefore be said to positively influence the work-life balance of employees (Nijp, 2016). This was shown to be of even more importance with shift workers (Nijp et al., 2012). There are different dimensions of WTC: the extent to which employees indicate to have a ‘need’, ‘access’ and ‘use’ of WTC (Nijp et al., 2015). The access to WTC was focused on here, as it is a prerequisite for the need and use of WTC, if they have access to WTC (Nijp et al., 2015). Higher levels of WTC may be helpful to manage the workload and to potentially prevent being away from home at critical times, underlining the positive associations found between WTC access and WLB in previous research (Kattenbach et al., 2010; Valcour, 2007). If employees perceive they have control over when to take time for personal needs, their perceived WLB was shown to be better (Jang, 2009; Mennino et al., 2005). Based on this, the following hypothesis regarding worktime control is developed.

*H4: Perceived access over worktime control positively affects the work-life balance.*

### **Strain of working schedules**

Next to the satisfaction with shift work schedules, there is also the option to measure WLB (and health) with an objective tool (Sustainable Employability tool by the company ModernWorkx). The combination of several aspects measured with the SE tool will be called strain of working schedules. This provides a more holistic approach; the whole shift work schedules can be analysed as one. The key characteristics of working schedules of employees

(e.g., length of shift, working times, weekends, nightshift, predictability, sequence) give an indication of the long-term workload and physical and social strain/risk of an employee. Factors which are assumed to have an impact on the physical strain of employees, according to the tool, are night shifts, series of night shifts, early shift starts and more. Employees are socially impacted by their work schedule with half and whole working weekends, the number of evening shifts, the unpredictability of the schedule and more (de Leede, 2019; de Leede & de Jager, 2018). A negative effect of this strain of the working schedules was found in literature, which is the basis for this tool (Åkerstedt et al., 2002; Härmä et al., 2015; Jansen & Kroon, 1995; Klein Hesselink et al., 2010; Knauth & Hornberger, 2003; Parkes, 2007; Sallinen & Kecklund, 2010; Tucker, 2003; Tucker et al., 2000; Van Amelsvoort et al., 2004). Therefore, a negative effect of strain of working schedules on the WLB of employees is expected which leads to the following hypothesis.

*H5: The strain of working schedules is negatively related to WLB.*

### 2.2.6 The public healthcare sector in Germany

The selected population of this research are shift workers in the public healthcare sector in Germany, where a general understanding of the issues and characteristics of the workers and industry is needed. Therefore, the following information is seen as crucial to understand the context and background of this research. With a population of roughly 83 million citizens and an unemployment rate of 3.8 %, Germany has one of the highest numbers of hospital beds, doctors and nurses per population in the EU (OECD, 2019). The public healthcare sector in Germany can be characterised by its focus on social benefits which is “based on the concept of social insurance as embodied in the principle of social solidarity” (Ridic et al., 2012). The system, focussing on providing health insurance for every citizen was established under Otto von Bismarck, the very first chancellor of Germany, with the Sickness Insurance Act of 1883 (Ridic et al., 2012). The German healthcare system is divided into public social health insurance (SHI) and private health insurance (PHI), where SHI makes up 87 % of the population, 11 % are insured privately and the remaining 2 % under a special scheme as soldiers or police (OECD, 2019). As mentioned in an article about the system of Buurtzorg Nederland: “Healthcare is an excellent example of a social problem that is complex and ‘wicked’ and not amendable to easy, predictable solutions” (Kreitzer et al., 2015). Nurses seem to be quite dissatisfied with their work in the public healthcare sector, as was analysed by Alameddine et al. (2016) over the span of 23 years (1990 to 2012). They came to the conclusion that there has been a steady decrease in job satisfaction of nurses (-7.5 %) compared to an increased satisfaction of doctors (+14.4 %) which could be due to various variables such as pay which increased by only 3.8 % for nurses and by 23.8 % for doctors (Alameddine et al., 2016, p. 107). Additional differences and characteristics of the public healthcare sector are that women make up 78 % of employees in the sector and only 22 % are men (Eurofund, 2017).

### 2.2.7 German Public Labour Law (TVöD)

According to the German Public Labour Law, in German: *Tarifvertrag für den öffentlichen Dienst* or *TVöD* (“Tarifvertrag für den öffentlichen Dienst (TVöD),” 2019), several different categories of employees are present: specialised workers, support staff and interns/trainees. These rules of employment have been established in Germany in 2005 and include rules and regulation regarding different work-related aspects. As this research is based in a company which operates according to this regulation book in the public healthcare sector and assumptions about the general public healthcare sector in Germany want to be made, these

regulations need to be discussed in more detail. An overview of the information below can also be found in *Appendix 6*.

The regulations of working hours in the 'TVöD' state that a normal full-time work week are 39 hours which should be divided over 5 working days. These regulations are stated in §6 Abschnitt 2 Absatz 1 and 2 of the 'TVöD' (Effertz, 2021, p. 109). Under the laws of the 'TVöD', shift work is defined as when "work is performed according to a shift schedule that provides for the regular alternation of the start of regular working hours" (see §7 Abs. 2 TVöD)(Effertz, 2021, p. 138). And night shift is defined as work done between 21m and 6am, for at least two hours into this time frame (see §7 Abs. 5 TVöD)(Effertz, 2021, p. 140). The German Working Hours Act was established in June 1994 and is stated in the BGB ('*Bürgerliches Gesetzbuch*'), which is the civil code of Germany. This civil code was already established and became effective in 1900. This Act is majorly influencing the regulations of the 'TVöD' which is why, it should be mentioned here. The reason for this law is to protect employees' rights and regulate regular breaks as well as Sunday and holiday work (Effertz, 2021, p. 118). The following rules and definitions are important for the frame of this research (p.118-119)(see *Table 2*). When considering both the Working Hours Act and the TVöD, one needs to point out that the definition of night shifts are slightly different, where the regulations of the Working Hours Act (time between 23pm and 6am) will be taken as leading.

*Table 2: Definitions according to the Working Hours Act ('Arbeitszeitgesetz')*

Working hours	working time from beginning of the work until the end without breaks
Night work	work in at least two hours of the time between 23pm- 6am
Daily working time	Not more than 8 hours, can be increased to 10 hours, if necessary
Rest breaks	30 minutes with work hours of more than 6 hours, 45 minutes with work hours more than 9 hours, can be broken down into 15 minute-breaks
Rest period	Min. 11 hours between the shifts, can be reduced to 10 hours if an extraordinary reason is present

### 2.3 Research model

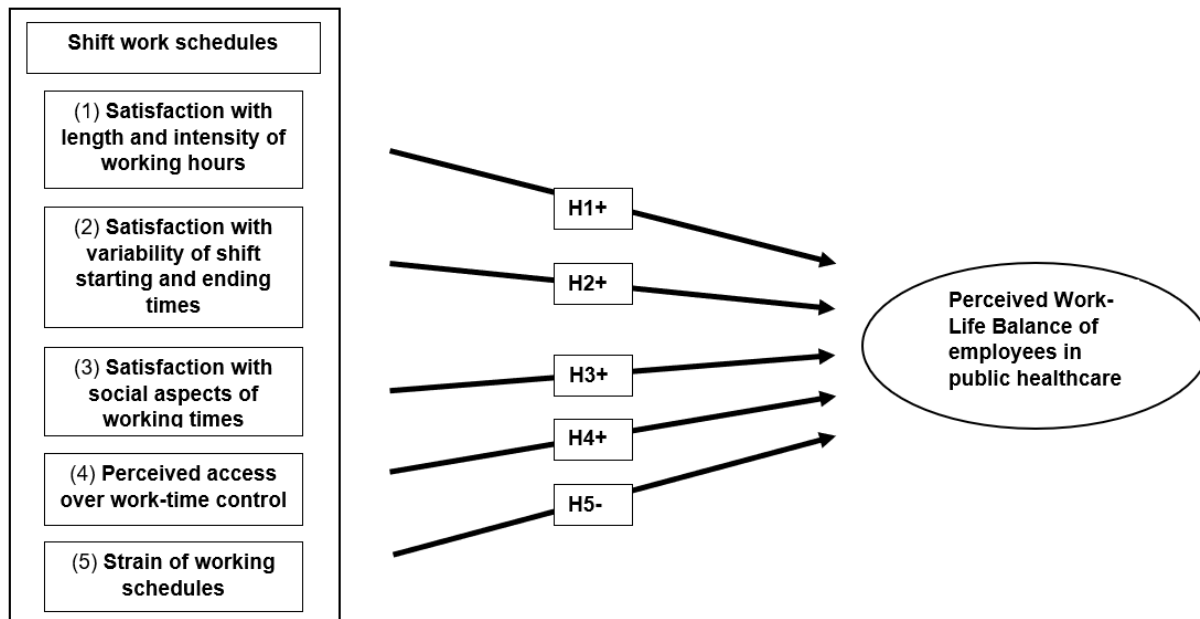
Based on the previous literature and research gap and goal, a research model can be identified. This includes the dependent variable Work-Life Balance which is influenced by the independent variable of shift work. The effect between these two variables and its components will be measured. A new and an existing measure will be used to strengthen its validity/reliability. Components of shift work include satisfaction with length and intensity of working hours, variability of start and ending times, and social aspects of working hours (based on Härmä et al. (2015)) which will be analysed in regard to their effect on work-life balance. The spill-over and work/family border theory are used to develop the hypotheses below (*Table 3*) that the two areas of work and family influence and impact each other, which is mostly expected to be a positive effect. Furthermore, the impact of perceived control over work time and the strain of working schedules on WLB will be analysed. The research model can then be displayed as in *Figure 1*.

*Table 3: Hypotheses for this research*

H1	The satisfaction with length and intensity of working hours positively affects WLB.
H2	The satisfaction with variability of shift start and ending times positively affects WLB.
H3	The satisfaction with social aspects of working hours positively affects the WLB.
H4	Perceived access over worktime control positively affects WLB.
H5	The strain of working schedules is negatively related to WLB.



Figure 1: Research Model



## 3 – Method

### 3.1 Research design

This research aims at conducting a quantitative and exploratory study with the help of a survey and risk assessment tool. Advantages of performing quantitative research with a statistical analysis are clear cut analysis and hypothesis testing where it is either confirmed or rejected (Martin & Bridgmon, 2012). This brings clear results and outcomes. Additionally, quantitative methods enable generalizability due to the ability to collect many more responses than would be possible with qualitative studies such as interviews (Roberts & Priest, 2006).

The structure of the research is to firstly collect objective data on shift work schedules with the tool. Next, to enable a more subjective consideration of the impact of shift work on employee's, a survey was used. Based on the literature, several existing and already validated measures and surveys were analyzed and these survey items have been combined into a suitable survey (*Appendix 7*). Surveys were distributed among the employees of the company 'HpH' to capture their perception of the impact of shift work schedules on work-life balance. The organization was chosen because of its broad influence and suitability for research with shift work schedules. It is well-known in the region and one of the bigger employers in the area.

To collect the data needed for this research, an online survey was constructed with the help of the online survey tool Qualtrics. The tool enables the individual construction of surveys with customized questions, the translation to the target groups' main language (German) and an easy export of the data into SPSS where the data was analysed with the help of statistical tests. Lastly, both outcomes (tool and survey) were combined, compared, and analysed.

#### **Selection of respondents/ participants**

Employees of the company, 'HpH', were selected to fill in the survey on their perception of their working schedules and its impact on their work-life balance. In the selection process of employees for this research, the author's aim was to get as many responses as possible for the survey from all over the company. The survey was open to all employees who work in shifts, so to everyone from the institutions where shift work is being done. With this, employees from different ages, genders and rank groups were approached. The selection process includes firstly to filter which employees work on shift work schedules and in the area of 'Living and Care' (as the company also operates in education and rehab facilities). Employees with management and administrative positions, as they do not work in shifts, and passive employees (due to pregnancy, long-term sickness, or others) were also excluded. The employees were therefore selected based on non-probability sampling, where the author decided which employee group to include (shift workers) and which group to exclude (management, administrative staff, passive employees). After the collection of data, it was checked whether employees from different positions, ranks, age, gender, etc. had answered the survey and were otherwise approached more. In the end, the total population comprised of 191 employees, which were approached with the survey. Since 5 predictors were tested in the survey, and 10 times the number of predictors responses were needed, at least 50 responses were necessary (Harrington, 2009). The sample comprised of 88 employees which leads to an acceptable response rate of 46 % according to Baruch and Holtom (2008).

### 3.2 Data collection

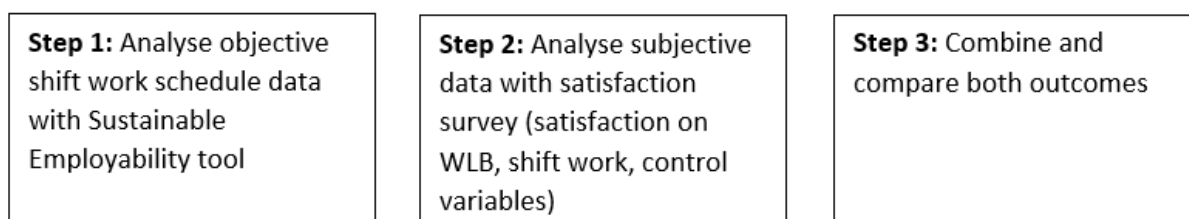
#### 3.2.1 Procedure

A pilot test was conducted where the survey questionnaire was sent to 5 participants to fill-in and questions were asked on how they would interpret the survey items and if they had any difficulties and needed more clarifications. A pilot test can be used to minimise

potential errors in answers because of misunderstandings of questions/ items and can maximise the response rate of the survey by being clear and easy to answer (Burgess, 2001). Later, adjustments were made, where necessary and the actual data collection was started. Changes after the pilot test included 'years employed at company' to be changed into different categories as none of the institutions are open longer than 20 years and a more detailed division between 4 and 10 years was asked for. Secondly, all questions about night shifts were taken and asked in a separate block at the end, after a filter question was introduced where the respondents fill in if they work in night shifts or not. If yes, the questions about night shifts were displayed and if not, the survey was ended. Lastly, the questions about variability of shift start and shift ending times were combined into one question as many employees indicated that they mean the same for them.

The survey was distributed to all employees at the company who work on shift schedules (191 employees) and the selected medium to distribute it, was via e-mail and personal communication. The author attended team meetings of the different institutions and work teams to be able to reach all employees and the survey was available in English as well as German, which is the main language for most of the respondents. This ensures better accessibility and a higher understanding of the survey as well as a higher response rate. Additionally, the author made use of the Sustainable Employability tool (SE tool) of the company ModernWorkx to assess the risk which employees are expected to have with their specific shift work schedule. This tool, as it is based on several articles on different aspects of shift work schedules, is seen as an ideal assessment method of the objective shift work schedules, because it enables a complex insight and, at the same time, provides an answer (risk assessment) in one number. Finally, both outcomes were compared to come to clear recommendations on what the company can improve, how the tool could be improved as well, based on this additional information and more literature. The information needed for the tool were the work schedules of the employees. The author made sure to include different possible combinations of workers, their shifts, gender, and more control variables as mentioned earlier in this chapter.

*Figure 2: Data collection procedure*



### 3.2.2 Research context

#### **Public healthcare sector in Germany**

The population the author aims to generalize towards includes employees within the public healthcare sector in Germany. To be able to make assumptions about this population, a sample of employees in a company was chosen to be surveyed about their perceptions in regard to their working times and work-life balance. Typical characteristics for this sample are the very complex type of work and intrinsic motivation needed to perform well on the job. The pay is limited due to the nature of the public sector and the work, most often, includes physical as well as heavy emotional and mental strain on employees (see *Appendix 8.1, 8.6, 8.7*).

### **Company: Heilpädagogische Hilfe Bersenbrück (,HpH‘)**

For the frame of this thesis, a company in the public healthcare sector in Germany was chosen. The company is called ‘Heilpädagogische Hilfe Bersenbrück’ (short: ‘HpH’) and is located in the region of Osnabrück, Germany. The organization was chosen because of its broad influence and suitability for research with shift work schedules. It is well-known in the region and one of the bigger employers in the area. The core values of the ‘HpH’ include family-focus and integration of everyone. These values are mirrored in the different specializations of the company which are quite broad, but all unite under these values. The ‘HpH’ specializes in the assistance and care of persons with different kinds and levels of impairments and disabilities. These range from all ages of the residents and types of impairments to different institutions with employees who ensure daily and around-the-clock support and care of the residents and patients. The company can be roughly divided into five areas, namely: Pre-school education & therapy, school education & assistance, work rehabilitation, consultation & assistance, and Living & Care. Since the focus in this thesis is on shift workers, the area of ‘Living & Care’ will be the focus area since it is the only area where employees work with shift schedules and can therefore be included in the research. An overview of all areas of the company and what they each entail, can be found in *Appendix 9*. Based on conversation notes with professionals in the area of healthcare at the company, additional information could be derived and added to the chapters about shift work and the public healthcare sector in Germany as well as to the German Public Labour Law (TVöD) where the focus on the most important aspects of the law was discussed with the professionals. These notes can be found in *Appendix 8*.

## **3.3 Measurement**

Based on different studies on the key variables of shift work schedules, work-life balance, and the impact of the latter on the former, existing survey questionnaires have been combined into one survey for the purpose of this research. The full survey with all questions can be found in *Appendix 7*. The survey consists of a total of 33 questions which assess the research topic and capture the perceptions (about satisfaction with different shift work schedule aspects and WLB) of the employees. Additionally, the SE tool was used to capture the objective data about shift schedules of the employees. The data was connected to personnel numbers (first question) to be able to analyse the shift work schedules of the respondents. Due to confidentiality reasons, these connections to personal data (personnel numbers or names) were deleted as soon as the data analysis was connected to the survey answers.

### **3.3.1 Dependent Variable: Work-Life Balance**

Different definitions and measures exist to analyse WLB as a construct. For the frame of this research, it was decided to focus on the validated survey with four questions to be able to assess the WLB of employees. The survey constructed by Brough et al. (2014) includes questions about the perceived balance of work and non-work activities. Four statements about WLB by Brough et al. (2014) are used to measure the perceived WLB of the employees. The statements are measured on a 5-Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. The statements regarding WLB can be found in the complete survey in *Appendix 7*. An example for a statement regarding WLB was ‘I feel like the balance between my work demands and non-work activities is currently about right’. The 5-Likert scale was taken over from the validated survey questionnaire as these five answer options offer the possibility to rate the perceived WLB on an extensive scale. Since the second

statement was reverse scored, it was re-coded for the analysis. The reliability of the measure was good and acceptable, with a Cronbach's Alpha of 0.847.

### 3.3.2 Independent Variables: Shift work

#### Use of survey for subjective data

Several questions (in the survey: Question 6-33) have been used to analyse the different variables regarding shift work schedules and Worktime Control. Since satisfaction with shift schedules is proven to be related to WLB (Beutell, 2010), the perception of shift schedules was collected by asking for the satisfaction with specific items. Satisfaction was therefore used as a measure of the perceived satisfaction with the shift work schedule. The variables from the study of Härmä et al. (2015), were changed to satisfaction questions (see *Appendix 5* for all variables from article) on a 5-point Likert scale. For each of the main variables (about aspects of shift schedules) asked, the survey will provide the respondents with several items which should be rated on a satisfaction scale. Additionally, the Worktime Control Access scale (Nijp et al., 2016) was used to capture the perceived control the respondents seem to have over their shift work schedules. The items included in each variable can be found in *Table 4* below.

*Table 4: Overview of items included in variables*

<b>Variable</b>	<b>Items included in variable</b>
Length and intensity of working hours (H1)	Weekly working hours
	Amount of overtime
	Number of consecutive working days
	Time between shifts (hours)
Variability of start and ending times (H2)	Amount of early morning shifts
	Amount of morning shifts
	Amount of day shifts
	Amount of evening shifts
	Variability of start and ending times
Social aspects of working hours (H3)	Amount of annual leave days
	Amount of weekend work
	Amount of single free days
	Amount of realized shift plans (worked as planned)
	Use of shift wishes
WTC (H4)	Realized shift wishes
	Control over start and ending times
	Control over when to take a break
	Control over when to take days off
	Control over which days to work
	Control over distribution of working hours over week
	Control over whether to work overtime

#### IV1 - Satisfaction with length and intensity of working hours

The length and intensity of working hours is measured by four items, using the measurement scale of a 5-point Likert scale from 1= Very unsatisfied to 5= Very satisfied. An example item is: 'How satisfied are you with weekly working hours/ amount of over-time/ number of consecutive working days/ time between shifts?'. This measurement is based on

the dimensions by Härmä et al. (2015). The variable's Cronbach's alpha score was acceptable with 0.703.

#### IV2 - Satisfaction with variability of start and ending times

The variability of shift start and ending times was measured by five items: 'How satisfied are you with the variability of start and ending times/ amount of early morning/ morning/ day/ evening shifts?'. This variable is also measured on a 5-point Likert scale. This measurement is based on the variables by Härmä et al. (2015) as well. The reliability of this variable was Cronbach's Alpha= 0.712.

#### IV3 - Satisfaction with social aspects of working hours

The variable "Satisfaction with the social aspects of working hours" was measured by six items. An example item is: 'How satisfied are you with the amount of annual leave days/ amount of weekend work/ amount of single free days/ amount of realized shift plans/ use of shift wishes/ realized shift wishes?'. Employees were asked how satisfied they are with this social strain of their shift schedule with several items, which was also measured on a 5-point Likert scale. This variable is again based on the variables by Härmä et al. (2015) and showed a reliability (Cronbach's Alpha) score of 0.786.

#### IV4 – Worktime Control

The perceived Worktime Control was measured using the scale developed by Nijp et al. (2016). The scale includes six items about the extent to which respondents feel like they can determine aspects of their working time themselves (starting and ending times, when to take a break, etc.). Here, a 5-Likert scale was also used but with the values of 1= (Almost) not at all, 2=To a limited extent, 3= To a reasonable extent, 4= To a high extent, and 5= To a very high extent. The WTC Access scale proved to be a reliable measure of Worktime Control, with a Cronbach's Alpha of 0.88. The complete scale can be found in *Appendix 11*.

#### **Use of tool for objective data (IV5 – Strain of working schedules)**

To measure shift work in an objective way, the Sustainable Employability tool by the company ModernWorkx was used. The shift work schedules of employees were analysed with the help of the SE tool, output being the risk index or strain of working schedules. This measure was chosen as a complementary measure (additionally to the survey which captures the satisfaction and perceptions). Here, the total score indicates the level of strain of the employee, the higher, the worse (0-3000= green/good, 3000-4000= yellow/okay, 4000 or more= red/ high risk) (de Leede, 2019; de Leede & de Jager, 2018). An overview of the factors and different risk areas can be found in *Appendix 10*.

More empirical testing and data is needed to confirm the usage of this tool. Here, the application in a new company within the public sector will help to further advance the tool since the tool is based on literature but does not directly consider subjective perceptions of the employees themselves. ModernWorkx is looking for new insights regarding the correlation of the number of points (risk assessment) of the tool and the actual experience of employees. The reliability of this tool is not possible to be measured by Cronbach's alpha, because of its complexity of analysis behind the tool.

### 3.3.3 Control Variables

With the help of control variables such as gender, age and position in the company, the author ensured that different ranks and age groups were represented in the survey output. The control variables are asked at the end of the survey (see *Appendix 7*). Control variables are

used in quantitative research to test for a spurious relationship so to exclude the possibility of an influence of a confounding variable on the main relationship which is being tested.

#### **CV1 - Personnel number**

The first 'question' in the survey will be about the personnel number of the employee: 'Please indicate your personnel number'. This is needed to later match the survey response of each employee with the risk score (based on the tool). Here, a disclaimer and explanation are needed so that the employees understand that this information is not used to evaluate and assess opinions and performance in any way. It was also clarified that all personal data and connection to the satisfaction ratings will be deleted as soon as the analysis is finished.

#### **CV2 - Gender**

The second control variable concerns the gender of the respondents. Gender was previously found to affect WLB (Sturges & Guest, 2004). Since most of the employees are women, this variable will be used to test for differences between men and women regarding the effect of shift work schedules on WLB. The question used for this variable is 'Which gender do you mostly identify with?' and answer options will include not only female and male but also third gender/ non-binary as well as 'prefer not to say'. With this variable, the author wants to test for gender differences in the effect of shift work schedules on WLB.

#### **CV3 - Age**

Next, the age of the respondents will be asked, for the same reasons as the gender. The age of employees was found to affect WLB before (Sturges & Guest, 2004). The question 'In which year were you born?' gives the opportunity for respondents to provide their exact year of birth. With this variable (which is changed to age groups later), the author wants to identify the biggest age groups and test for age group differences in the effect of shift work schedules on WLB.

#### **CV4 - Marital status**

The marital status of the employees ('Which marital status best describes your situation?') is asked to be able to check for a potential relationship between the impact on WLB of employees who are single or in a relationship. The marital status was found to affect WLB of employees in earlier research (Sturges & Guest, 2004). This aspect of the employee's private life seems relevant for the frame of the research as it provides more insights into the private life of the respondents which influences the perceived necessary work-life balance.

#### **CV5 - Taking care of someone**

The same reasoning is behind the question about if employees have someone who they need/want to take care of in their private life: 'Do you take care of someone?'. Taking care of someone was previously found to affect WLB (Sturges & Guest, 2004).

#### **CV6 - Institution**

As mentioned before, there are different institutions with shift workers at the company. Due to different shift systems in the different institutions, it is interesting to see which answers which institution's employees give. The question about this control variable is 'Which institution is your main workplace?'. Different institutions at the company 'HpH' include the 'Neurologisches Pflegezentrum' (NPZ), 'Haus Quadenort', 'Haus am Bokeler Bach' (BoBa), 'Haus an der Möhringsburg' (HadM) and 'Grünegräser Weg' (GGW).

### **CV7 - Position in the company**

To control for a potential effect of the position and rank of the employee, the position is also asked in the survey: 'Which of the following best describes your position at the company?' where answer possibilities include if they are a specialised care worker or a support staff employee. This control variable is needed to control for potential differences between these two kinds of workers' positions.

### **CV8 - Years working for the company/ Tenure**

The question 'How many years have you already been working at the company?' will be used to test if the employee's time at the company influences their perceptions in regard to shift work schedules and WLB. Just asking for the employees age is not enough for this, as employees might be above 50 years old but only work for the company for 1-3 years. Previous research has found differences in tenure years and its effect on WLB (Oosthuizen et al., 2016).

## **3.4 Data analysis**

### **3.4.1 Analysis of survey data**

The data analysis of the survey questionnaire data was conducted with the help of the statistical program 'IBM SPSS Statistics, Version 27'. Since the data about WLB and shift schedules (satisfaction and Worktime Control) was measured on a 5-point Likert scale, the data was measured with multiple items per construct, making it interval data. Firstly, the demographic variables were analysed and summarised in a table, providing an overview of the sample and its characteristics. Furthermore, indexes of the survey items were made based on the main variables and reliability of these was tested. These indexes were then used to make a correlation table to test for correlations between the main constructs (WLB, satisfaction with shift work schedule aspects, Worktime Control). Then, the normality of the variables was confirmed and based on this, a hierarchical linear multiple regression analysis was performed. Here, WLB is the dependent variable, shift work schedule and its aspects are part of the independent variable 'shift work schedules' and the other variables are treated as control variables (gender, age, marital status, etc.).

### **3.4.2 Analysis of tool output**

For the second part of the analysis, the work schedules of shift workers were added into the SE tool and the outcome was automatically generated by the tool itself. The actual working plans of all employees who answered the survey were taken and analysed. Due to the irregularity of the schedules, a period of five months was chosen, the five months before the start of the survey, so April to August 2021. As the tool assumes that this schedule is the same as added in the tool, the used schedules must be representative (de Leede, 2019). The analysis was done per institution where one file of the tool was used per institution. The process of the data schedule input consisted of filling in shifts (e.g., 'F1' for an early shift) and then adding the shift type to the code list (e.g., 'F1'= start time of 09:00h, end time of 14:00h, break of 00:30h). The calculation of the risk score per employee is then done automatically in the background of the tool and shown next to the input table. The total risk index (called "Strain of working schedules"), start value (based on general assumptions such as percentage of shift wishes and more), physical risk and social risk was taken and added as an extra variable in the SPSS file, matching the same employee's response. The output of the tool can be found in *Appendix 12*.

Additionally, a few aspects were considered which should be elaborated here as well. Firstly, vacation days were not considered in the tool analysis and the days were filled in



oriented on how employees usually work. For training days, employees were considered as absent. When sick, the scheduled shift was added, as if the employee had worked. And lastly and arguably most importantly, as soon as the analysis with the tool was finished and the results matched to the SPSS file, all personal data from employees was removed to ensure confidentiality.

### 3.4.3 Comparison

The final step was to compare the statistical output and analysis outcomes with the outcomes of the tool which was done by manually adding the risk score of the tool. Multiple regression was used to analyse the relationship between the perceived satisfaction of shift schedule aspects (as tested in the survey) and the risk scores from the SE tool output. The perceived satisfaction with the shift schedule was compared with the actual shift schedules risk score as given by the tool. In regression, it is possible to control for other variables, such as the control variables (gender, etc.) and to include more than one predictor simultaneously. In multiple regression, one dependent variable (in this research: Work-Life Balance) and multiple predictor or independent variables and control variables are analysed in relation to each other. With hierarchical linear regression analysis, several models are computed with different combinations of predictor variables. Later, it will be possible to give an answer if the tool's outcome and the employee's perceptions match and if the tool is therefore a reliable method to test the employee's shift schedules and its effect on their WLB.

### 3.4.4 Trustworthiness of the research

The issues of reliability and validity of the method should also be addressed. Since a survey questionnaire has several advantages and they also refer to the reliability and validity of the research, this method is seen as suitable for this research. Advantages include the possibilities to "(1) collect more current data, (2) being able to examine a host of variables not found in health, safety and personnel records, (3) providing easier access to data, and (4) providing data that are more consistent from one source to another" (Smith et al., 1979, p. 13). Surveys enable a collection of a higher number of responses which enable generalizability to the population. The reliability of the research was further ensured by the use of measurement scales for the variables which have an acceptable Cronbach's alpha value (higher than 0.7). And a pilot test was used to ensure internal consistency, understandability, reliability, and validity of the survey.

## 4 – Results

### 4.1 Demographic variables

The first step was to analyse the descriptive statistics (see *Table 5*). Most respondents were female (77.2%) and between 21 and 30 years old (32.9%). 67.1% of the respondents indicated to be in a relationship rather than single (32.9%). Most respondents indicated that they take care of someone in their private life (54.4%), and if so, mostly parents or grandparents (25.3%), closely followed by children under 12 years old (19%) and children above 12 years old (11.4%). Most responses can be traced back to respondents from main workplaces as 'Haus am Bokeler Bach' and 'Haus an der Möhringsburg' (24.1% each) and 'Haus Quadenort' and 'Neurologisches Pflegezentrum (NPZ)' (21.5% each). The least responses were captured by employees from 'Grünegräser Weg' (8.9%). Specialised workers were 60.8% of the sample and support staff 39.2%. Most respondents have been working at the company for 1-3 years (31.6%), followed by 4-7 years (25.3%). Out of the respondents, 19% indicated that they work in night shifts regularly.

*Table 5: Demographic characteristics*

<b>Variable</b>	<b>Category</b>	<b>Frequency (f)</b>	<b>Percentage (%)</b>
Gender	Male	18	22.8
	Female	61	77.2
Birth Year	18-20 years	1	1.3
	21-30 years	26	32.9
	31-40 years	21	26.6
	41-50 years	8	10.1
	51-60 years	19	24.1
	61-70 years	4	5.1
Marital status	Single	26	32.9
	In a relationship	53	67.1
Take care of someone	Yes	43	54.4
	No	36	45.6
Main workplace	Haus am Bokeler Bach	19	24.1
	Haus an der Möhringsburg	19	24.1
	Haus Quadenort	17	21.5
	Neurologisches Pflegezentrum	17	21.5
	Grünegräser Weg	7	8.9
Position at company	Fachkraft	48	60.8
	Hilfskraft	31	39.2
Tenure	< 1 year	6	7.6
	1-3 years	25	31.6
	4-7 years	20	25.3
	8-10 years	10	12.7
	11-15 years	9	11.4
	>15 years	9	11.4
Night shift	Yes	15	19
	No	64	81

## 4.2 Correlation table

The descriptive statistics of the variables (*Table 6*) show different mean values, these will be analysed first. Lowest mean of main variables seems to be for worktime control (2.19) and the highest value can be found at variability of start and ending times (3.44). For better interpretation, being able to test significances and avoid skewed results, the variables were standardized. This leads to more reliable analysis in the next step (the regression analysis). The skewness and kurtosis of the main variables are between -7 and +7 which means that the data can be considered as normal according to George (2011) and Hair et al. (2010). As for the control variables, the findings have been described as part of the demographic variables table in chapter 4.1.

*Table 6: Mean, Standard Deviation, Skewness & Kurtosis of variables*

<b>Variable</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>SD</b>	<b>Skewness</b>	<b>Kurtosis</b>
<b><i>Dependent Variable</i></b>						
1.WLB	3.12	1.00	5.00	0.843	-0.36	-0.337
<b><i>Independent Variables</i></b>						
2.Satisfaction with length & intensity working hours	3.22	1.75	5.00	0.678	-0.04	-0.496
3.Satisfaction with variability of start & ending times	3.44	1.80	5.00	0.568	-0.29	0.509
4.Satisfaction with social aspects of working hours	3.43	2.00	5.00	0.627	-0.05	-0.540
5.Worktime Control	2.19	1.33	3.50	0.550	0.49	-0.572
6. Strain of working schedules	2170	984	3270	473.17	-0.028	0.051
<b><i>Control Variables</i></b>						
7. Gender*	0.77	0	1	0.422	-1.32	-0.257
8. Age	3.38	1	6	1.33	0.39	-1.157
9. Marital status	1.67	1	2	0.473	-0.74	-1.489
10. Taking care of someone**	0.54	0	1	0.501	-0.18	-2.019
11.Workplace Bokeler Bach**	0.24	0	1	0.430	1.24	-0.480
12.Workplace Quadenort**	0.22	0	1	0.414	1.41	-0.004
13.Workplace HadM**	0.24	0	1	0.430	1.24	-0.480
14.Workplace NPZ**	0.22	0	1	0.414	1.41	-0.004
15.Workplace GGW**	0.09	0	1	0.286	2.95	6.886
16. Position Fachkraft***	0.61	0	1	0.491	-0.449	-1.846
17. Tenure	3.23	1	6	1.485	0.54	-0.757
18. Night shifts**	0.19	0	1	0.395	1.61	0.614

\*0= male, 1= female

\*\*0= No, 1= Yes

\*\*\*0= Hilfskraft (Support staff), 1= Fachkraft (Specialized workers)

Table 7: Correlation Table

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Dependent Variable</i>																		
<b>1.WLB</b>																		
<i>Independent Variables</i>																		
<b>2.Satisfaction length &amp; intensity of working hours</b>	.503**																	
<b>3.Satisfaction variability start &amp; ending times</b>	.227*	.442**																
<b>4.Satisfaction social aspects of shift work</b>	.571**	.528**	.284*															
<b>5.Worktime Control</b>	.424**	.275*	.291**	.430**														
<b>6.Strain of working schedules</b>	-.265*	-.103	-.021	.046	-.115													
<i>Control Variables</i>																		
<b>7. Gender</b>	.188	.086	-.047	.082	-.157	.106												
<b>8. Age</b>	.120	.155	-.054	.034	-.067	.016	.201											
<b>9. Marital status</b>	-.033	.087	.069	.008	-.055	.214	.069	.180										
<b>10. Taking care of someone</b>	-.032	-.118	-.114	-.059	.131	-.057	-.012	-.198	-.154									
<b>11.Workplace Bokeler Bach</b>	-.056	-.380**	-.103	-.172	.170	-.083	-.189	-.005	-.047	.039								
<b>12.Workplace Quadenort</b>	.052	.230*	.148	-.070	-.092	.075	.138	.106	.105	-.016	-.295**							
<b>13.Workplace HadM</b>	.076	.026	-.135	.112	.026	-.171	-.118	-.273*	-.110	.158	-.317**	-.295**						
<b>14.Workplace NPZ</b>	-.178	.047	-.038	.061	-.111	.106	.064	.059	.170	-.078	-.295**	-.274*	-.295**					
<b>15.Workplace GGW</b>	.153	.130	.198	.103	-.002	.120	.169	.180	-.161	-.162	-.175	-.163	-.175	-.163				
<b>16. Position Fachkraft</b>	-.083	.058	-.025	.105	.151	.158	-.066	-.259*	.154	.045	-.094	.042	.149	.042	-.206			
<b>17. Tenure</b>	-.217	-.145	-.114	-.239*	-.254*	.185	-.018	.422**	.017	-.065	-.007	.191	-.107	.003	-.109	.089		
<b>18. Night shifts</b>	-.110	.059	.045	.092	-.191	.404**	.186	-.017	.064	-.140	-.197	-.018	-.272*	.453**	.076	.059	.056	

Note: N= 79 employees (night shifts: N= 15)

\*\*Correlation significant at 0.01 level (2-tailed) ( $p < .01$ )

\*Correlation significant at 0.05 level (2-tailed) ( $p < .05$ )

In the correlation table (*Table 7*), the relationships between the main variables were analysed. Since Work-Life Balance is the dependent variable of this research, it was analysed in relation to all independent variables. As for the results of the correlation analysis, one can clearly identify significant correlations between WLB and some variables regarding satisfaction with shift work schedules and Worktime Control. Multicollinearity can be ruled out because the maximum correlation between the independent variables is .571 which is below the threshold of .90 (Janssen, 2000).

WLB has significant and positive correlations to satisfaction with length and intensity of working hours ( $r(77) = .503, p = .000$ ), satisfaction with variability of start and ending times ( $r(77) = .227, p = .044$ ), satisfaction with social aspects of shift work ( $r(77) = .571, p = .000$ ) and Worktime Control ( $r(77) = .424, p = .000$ ). The connection of the strain of working schedules with the dependent variable WLB was found to be significantly negative and moderate ( $r(77) = -.265, p = .018$ ). The other satisfaction variables about the shift work schedule aspects and WTC were not found to be significantly correlated to the strain of working schedules. An overview of the results from the tool can be found in *Appendix 12*.

Regarding the control variables included in the research, it was possible to identify some significant correlations. The tenure was shown to be correlated to Satisfaction with the social aspects of working hours ( $r(77) = -.239, p = .034$ ) and with WTC ( $r(77) = -.254, p = .024$ ). These negative correlations indicate that employees who work for less years at the company, perceive a higher satisfaction with the social aspects of working hours and a better control over their worktime. Working in night shifts was not significantly correlated to any of the main variables, except for the negative correlation with the Strain of working schedules (SE tool risk index) ( $r(77) = .404, p = .000$ ). Since there were no other significant correlations found, the additional questions on night shift working schedules will not be analysed further.

### Results from the SE tool

Regarding the strain of working schedules (the output from the tool), a mean value of 2140 was found, in a quite acceptable and low-risk range. The lowest risk area includes any score from 0 to 3000, the middle/increased risk area includes the scores from 3000 to 4000 and finally, the highest risk score range are 4000 or more (de Leede & de Jager, 2018). We can see that the highest score in the sample was 3270 and the lowest 984 which are within the lower and middle ranges. The highest risk score was found at the institution 'Grünergräser Weg' and lowest at the 'Haus an der Möhringsburg'. The strain of working schedules was highest for employees between 18-20 and then again between 41-50 years and the strain seems to be higher when the employees work at the company for longer (longer tenure) (see *Appendix 12*).

### 4.3. Hierarchical Linear Regression analysis

Since the correlation table (see *Table 7*) only assesses whether two variables are related to each other, the hypotheses will be tested with the help of hierarchical linear regression analysis. The first model includes the Control Variables in relation to the dependent variable WLB, the second model adds the satisfaction variables of the survey data, and in the third model the SE tool data variable of the strain of working schedules and CVs are used. In the fourth model, all variables are used in combination. An overview of the regression results can be found in *Table 8*.

**Model 1** includes the control variables in relation to the WLB, to analyse the sole effect of the control variables on the dependent variable. The control variables of "Age" ( $\beta = .258, p < .1$ ) and "Tenure" ( $\beta = -.322, p < .05$ ) had a significant negative effect on WLB. Hence, being

younger is related to higher WLB, whereas more years at company will lead to lower WLB. The model has an adjusted R-Square value of 3.9%.

*Table 8: Results of regression analysis, with work-life balance as dependent variable*

	WLB			
	Model 1	Model 2	Model 3	Model 4
	$\beta$	$\beta$	$\beta$	$\beta$
<b>Control Variables</b>				
Gender	.143	.181*	.148	.181*
Age	.258*	.024	.226	-.004
Marital status	-.059	-.009	.001	.054
Taking care of someone	-.032	-.026	-.019	-.017
Workplace Quadenort	.081	-.042	.083	-.013
Workplace HadM	.113	-.026	.096	-.034
Workplace NPZ	-.114	-.194	-.138	-.205
Workplace GGW	.057	-.018	.102	.040
Position Fachkraft	.031	-.134	.056	-.111
Tenure	-.322**	-.032	-.266**	.020
Night shifts	-.037	-.059	.062	.035
<b>Survey variables &amp; CV</b>				
Satisfaction with length and intensity of working hours		.292**		.235*
Satisfaction with variability of start and ending times		-.063		-.076
Satisfaction social aspects of working hours		.348***		.393***
Perceived Worktime Control		.222*		.222**
<b>SE tool variable &amp; CV</b>				
Strain of working schedules			-.258*	-.255**
<b>F</b>	<b>1.285</b>	<b>4.468***</b>	<b>1.669</b>	<b>4.924***</b>
<b>Delta R<sup>2</sup></b>	<b>.174</b>	<b>.341***</b>	<b>-.119</b>	<b>.679**</b>
<b>R<sup>2</sup></b>	<b>.174</b>	<b>.515</b>	<b>.222</b>	<b>.560</b>
<b>Adjusted R<sup>2</sup></b>	<b>.039</b>	<b>.400</b>	<b>.080</b>	<b>.446</b>

\* $p < .1$ ; \*\* $p < .05$ ; \*\*\* $p < .01$ .

**Model 2** further includes the direct effects of the satisfaction variables about shift work on WLB. This model shows that three aspects have a significant effect on WLB: three independent variables and one control variable. The variables “satisfaction with length and intensity of working hours” ( $\beta = .292$ ,  $p < .05$ ), “satisfaction with social aspects of working hours” ( $\beta = .348$ ,  $p < .01$ ), and “Worktime Control” ( $\beta = .222$ ,  $p < .1$ ) have a significant and positive effect on WLB. The control variable “Gender” ( $\beta = .181$ ,  $p < .1$ ) also showed to have a positive effect on WLB. The effect of the control variables changed from Model 1 to Model 2: the “tenure” and “age” do not have a significant effect anymore. The model shows an adjusted R-Square of 40.0%.

**Model 3** includes the strain of working schedules of the SE tool as the only independent variable to compare with Model 2. This model shows that the strain of working schedules significantly and negatively affects the WLB ( $\beta = -.258$ ,  $p < .1$ ). Again, “Tenure” has an effect on WLB ( $\beta = -.266$ ,  $p < .05$ ). The model shows an adjusted R-Square of 8.0%.

**Model 4** combines all variables into one regression model: WLB, satisfaction variables on shift work, Worktime Control, strain of working schedules based on SE tool and the control variables. Now, four independent variables and one control variable have an effect on WLB. The “satisfaction with length and intensity of working hours” ( $\beta = .235, p < .1$ ), “satisfaction with social aspects of working hours” ( $\beta = .393, p < .01$ ), Worktime Control ( $\beta = .222, p < .05$ ), and the strain of working schedules ( $\beta = -.255, p < .05$ ) have an effect on the WLB. Additionally, “Gender” ( $\beta = .181, p < .1$ ) has an effect on WLB in this model. The adjusted R-Square of this model is the highest of all models: 44.6%.

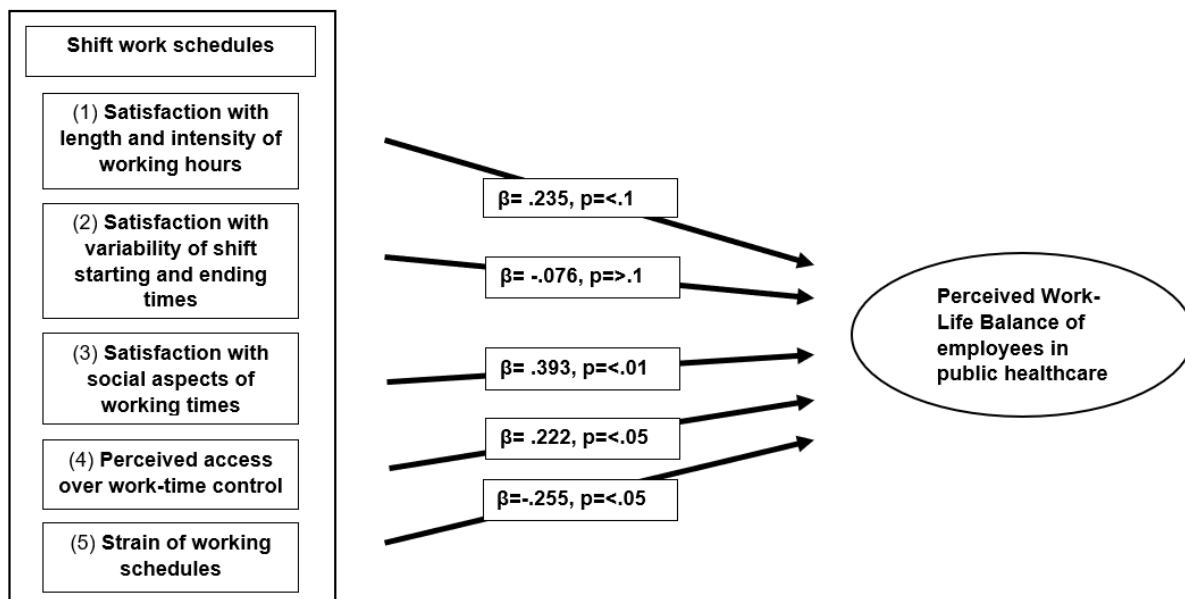
It was expected that the satisfaction with length and intensity of working hours would positively affect WLB (H1). The variable “Length and intensity of working hours” was significantly and positively affecting WLB in both Regression models 2 and 4 which **supports H1**. The satisfaction with variability of start and ending times does not have an effect on WLB, as the variable did not show a significant effect in the model of satisfaction variable nor in the model including the SE tool data. Therefore, **H2 can be rejected**. The variable of “satisfaction with social aspects of working hours” was proven to have a positive and significant effect on WLB, in both Model 2 and Model 4. This **supports H3**. Worktime Control (WTC) has a significant positive effect on WLB, in both Model 2 and Model 4. This leads to **supporting H4**. The strain of the working schedules, as captured by the SE tool, was shown to have a negative significant effect on the perceived WLB of employees, meaning that when the strain of working schedules is lower, the perceived WLB is better. This **supports H5**.

Based on this, the hypotheses of the research could be answered with the help of the final regression model 4 (*Table 9*). Therefore, the following research model can be confirmed with the significant findings of the research (*Figure 3*).

*Table 9: Answers to Hypotheses*

	<b>Hypothesis</b>	<b>Result</b>	<b>Evidence</b>
H1	The satisfaction with length and intensity of working hours positively affects WLB.	Supported	( $\beta = .235, p < .1$ )
H2	The satisfaction with variability of shift start and ending times positively affects WLB.	Rejected	( $\beta = -.076, p > .1$ )
H3	The satisfaction with social aspects of working hours positively affects the WLB.	Supported	( $\beta = .393, p < .01$ )
H4	Perceived access over work-time control positively affects WLB.	Supported	( $\beta = .222, p < .05$ )
H5	The strain of working schedules is negatively related to WLB.	Supported	( $\beta = -.255, p < .05$ )

Figure 3: New research model based on confirmed findings





## 5 – Discussion

### 5.1 Key findings

The main findings of this research are that variables such as “length and intensity of working hours”, “social aspects of working hours”, and “Worktime Control” have a significant effect on the Work-Life Balance of employees in the public healthcare sector. The satisfaction with length and intensity of working hours, as well as satisfaction with the social aspects of working hours and the perceived worktime control showed a positive effect on WLB, where an increase in satisfaction with the shift work schedule aspect means that the perceived WLB also increases. A negative significant effect of the risk score/ strain on WLB was found, meaning that the risk score or strain decreases when the perceived WLB increases.

The combination of both survey and SE tool data/ methods (Regression model 4) therefore includes four significant independent variables (Length & intensity of working hours, social aspects of working hours, Worktime Control, strain of working schedules) which have an effect on WLB. The new findings, in relation to the existing literature, can be summarised as findings based on the survey data (analysis of satisfaction with shift work schedules), objective work schedule data (analysis with SE tool) and the combination of both analyses. These findings have theoretical as well as practical implications.

### 5.2 Theoretical implications

Firstly, based on the specific research findings, general implications for the Work-Life Balance of employees are given, then the independent variables of the satisfaction with shift work schedule aspects and the discussion of the SE tool results will be elaborated on. Finally, the two methods were combined, and it will be discussed which implications this can have for theory and the research field in general. These implications are of special value for the academic fields of human resource management (HRM), occupational health and safety, public healthcare studies, and employee well-being literature.

#### 5.2.1 Work-Life Balance

Since many factors can influence WLB, it was assumed that the employees in this research (shift workers) would have a low perceived WLB of less than neutral. This was confirmed with the data and adds to existing literature with new data of a German organization in 2021. The WLB differed based on different control variables.

Existing literature concludes that shift work affects the family and social life of employees, as opportunities for participation in social activities are limited (Harrington, 2001). The negative effect of shift work seems to be more dominant but shift work can also create opportunities for more flexible appointment planning in the free-time (Harrington, 2001). Generally, a negative effect of straining and unpredictable shift work schedules on WLB of employees was expected, as supported by existing literature (Albertsen et al., 2014; Albertsen et al., 2008; Arlinghaus & Nachreiner, 2016; Dall’Ora et al., 2016; Greubel et al., 2016; Wöhrmann et al., 2020). The variables describing dimensions of working time patterns by Härmä et al. (2015) as well as the Worktime Control (Nijp, 2016) variable were analysed in relation to WLB. Based on the survey and its satisfaction variables of shift work schedule aspects, it could be concluded that some of these variables seem to be significantly related to WLB. Significant predictors of WLB (as can be seen in Regression model 2 and 4) are the independent variables of “Satisfaction with length and intensity of working hours”, “Satisfaction with social aspects of working hours”, “Worktime Control” and “Strain of working schedules”. The variable “Satisfaction with variability of start and ending times of shifts” does not have a

significant effect on WLB, which contradicts the expectations of existing literature. The positive significant effects of the three variables are of the satisfaction with these variables. This means that when the satisfaction with them was higher, the perceived WLB was also higher. The hypotheses (with the expected positive effects) were confirmed, as this also means that when satisfaction is higher, the WLB is higher as well. The hypothesis about the strain of working schedules and WLB could be confirmed as well, meaning that when the risk or strain of employee's schedules is higher, the perceived WLB is lower (significant negative effect).

### 5.2.2 Satisfaction with length & intensity of working hours

Based on literature, a positive effect of the satisfaction with length and intensity of working hours on WLB was expected, where the Compensation theory of WLB argues that "work and family life influence each other, and so employers, societies and individuals cannot ignore one sphere without potential peril to the other" (Clark, 2000, p. 749). The Spillover theory stated that behaviours in one area would carry over to the other (from work to family and the other way around)(Clark, 2000, p. 749) and the Effort-Recovery theory explains that enough recovery time is necessary for a good WLB (Meijman & Mulder, 2013). In this research, the "satisfaction with length and intensity of working hours" was shown to affect WLB of employees significantly. This means that the indicators of this variable (weekly working hours, amount of overtime, amount of consecutive shifts, and time between shifts) should be focussed on especially. Based on previous research, a fixed rotation schedule was named as a positive influence on WLB, making the length and intensity of working hours having a positive effect on the WLB (Bambra et al., 2008; Minonzio et al., 2018; Shiffer et al., 2018; Van Amelsvoort et al., 2004).

### 5.2.3 Satisfaction with variability of start and ending times

With changing starting and ending times of shifts, balancing work and private life becomes increasingly difficult. This is also supported by the Compensation theory as employees have less time to plan for private events and family time (Clark, 2000). In the current research, this variable does not have a significant effect on WLB. This could be explained by the fact that many employees did have rather similar start and ending times, where some employees always work for a specific time (morning half-shift to get residents ready for work, 6am-9am). Another possible explanation of this insignificant effect could be that the satisfaction with the variability of start and ending times was measured and not the actual variability of start and ending times. This finding should be confirmed with the help of further research, as it seems odd that the variability of starting and ending times does not have an effect on WLB, when this was previously confirmed by other studies.

### 5.2.4 Satisfaction with social aspects of working hours

The satisfaction with social aspects such as not having enough annual leave days, working in the weekend, having too many single free days (instead of more days in a row to rest) and no/not enough consideration of shift wishes was expected to have a positive effect on the WLB of employees. This was supported by the Work/Family Border theory (Clark, 2000) which states that a supportive communication is needed to perceive a good WLB with the social aspects of working hours. As discussed in the results in the previous chapter, this variable was found to have a significant and positive effect on WLB of employees. This means that when employees perceive a higher satisfaction regarding their annual leave days, weekend work, single free days and shift wishes, their perceived WLB is higher. Organizations should therefore ensure a high satisfaction with these social aspects by reducing the weekend

work for employees, having less single free days (more free days in a row), and considering more shift wishes. For the theory, this finding supports the existing literature (Clark, 2000; Knauth & Hornberger, 2003; Sallinen & Kecklund, 2010; Williams, 2008; Wöhrmann et al., 2020) with additional support of the relationship between annual leave days/ weekend work/ single free days/ shift wishes and WLB of employees. This provides supplementary information on what to consider with shift work schedules in order to improve/ keep a steady work-life balance.

### 5.2.5 Worktime Control (WTC)

Previous literature stated that Worktime Control positively influences the job motivation and work-life balance of employees (Nijp et al., 2016). Within the current research, a significant effect of WTC on the WLB of employees was found. This indicates that the variable is important in the context of explaining WLB and the findings by Nijp et al. (2016) could be supported. When the employees perceive more control over their working time, they also perceive a higher WLB. For research, this finding underlines the importance of including Worktime Control as an aspect when measuring and improving the WLB of employees. Further studies on the relation of WTC and WLB (Geurts et al., 2009; Geurts & Demerouti, 2003; Nätti et al., 2014; Nijp et al., 2012; Schieman & Young, 2010) have been published and could be considered for future research. The aspect of WTC could be integrated in more detail with more scales (e.g. WTC need and WTC use) (Nijp, 2016). It would bring more insight to also additionally analyse the employee's need for WTC and the use of possible WTC, in order to avoid a mismatch between need and access to WTC (Nijp et al., 2012). Employees might not have access to WTC, but also do not have a need for WTC, or the other way around. This could be investigated within the frame of further research.

### 5.2.6 Strain of working schedules (as captured by SE tool)

Generally, the mean of the strain of working schedules scores was in the green/ low risk area (see *Appendix 12*). The effect of the strain on the WLB was found to be significant and negative, meaning that the strain of working schedules of employees decreases when perceived WLB increases and the other way around. The model (Regression Model 3) just based on the SE tool alone, is not able to explain a majority of the variance in WLB. The idea would be to combine subjective and objective data, leading to regression model 4, which shows that both subjective and objective data seem to be still significant and now the explained variance has increased to 44.6 %. The best option to explain the changes in WLB seems to be to combine both measures to capture the complete effect. This confirms the expectations that the SE tool on its own is not sufficient to capture the subjective WLB of employees. This can be explained by the fact, that the SE tool was invented to measure WLB and health of employees and within this research, only the aspect of WLB was analysed. Further studies in different settings and with a larger sample are needed to confirm this finding and to further validate the SE tool as a measure to assess the risk score of employee's shift work schedules. The employee's (perceived) health should then also be included in the analysis.

The theoretical implication of this finding is that the SE tool can partially be confirmed as one of the predictors of WLB, which should be combined with another method, such as a satisfaction survey. Research should further investigate this rather new SE tool, which could potentially become a new practically useable tool for organizations and consultancy firms.

### 5.2.7 Findings based on combination of all variables (Regression Model 4)

Overall, these findings show that the biggest effects on WLB seem to be by the variables “satisfaction with length and intensity of working hours”, “satisfaction with social aspects of working hours”, “Worktime Control”, “strain of working schedules by the SE tool”, and Gender (lower WLB for men). The combination of the two models (Regression model 2 and 3) shows that 44.6 % of changes in Work-Life Balance can be explained by this model (Regression Model 4). This means that these variables should be considered especially by the organization when aiming to improve the perceived WLB. This adds to the existing literature as the measures where the method of using both the Sustainable Employability tool and a satisfaction survey with several different items has not been used in this combination before. This new combined method to predict the WLB adds to the existing literature (Härmä et al., 2015; Iskra-Golec et al., 2017; Williams, 2008) where such measure does not exist (yet). The significant regression models can be further researched and tested in different contexts and with larger samples to underline the method’s validity and reliability.

A difference for gender in relation to WLB was found, however, it seemed to be rather higher for female employees, contradictory to the expectations (Åkerstedt et al., 2002), which could be because of different/ less working hours in general. But since there were also more women in the sample, this finding should be taken with caution.

## 5.3 Practical implications

Implications for practice include general practical implications for managers of healthcare institutions and later, recommendations for the company ‘HpH’ and ‘ModernWorkx’. This entails a look into what can generally be done to prevent a negative effect of shift work schedule aspects on WLB, possible improvements of shift work schedules, and afterwards concrete advice to the organization ‘HpH’. As suggested by Diez et al. (2019), one recommendation for each insight will be provided. Furthermore, the company ‘ModernWorkx’ can use these implications to improve the Sustainable Employability tool as a practical measurement of employee’s strain of working schedules.

### 5.3.1 How to prevent a negative effect of shift work schedule aspects on WLB

In order to prevent dissatisfaction of employees with their shift work schedule, there are different preventive and compensatory measures which a company can take. Knauth and Hornberger (2003) mention different measures (see Table 1-3 of the article) such as having no more than 3 shifts of each shift type (morning, evening, night) in a row, to avoid permanent night work where possible, to use forward-rotation where possible and to not have more than 5-7 successive working days in a row. They also mention that there is “no single optimum solution”(Knauth & Hornberger, 2003, p. 109) but companies can try to implement as many employee-friendly aspects as possible. Other possible measures to prevent this negative effect could be to implement more rest breaks, both during the shifts and between shifts which can lead to a decrease of general stress and strain on the employees and improve social relationships at work (Tucker, 2003). Designing shift schedules more flexibly, having the support of senior management, a generally supportive organizational culture, as well as assistance of HR staff in regard to arranging flexible shift schedules, will improve the employees satisfaction with their schedules and their work-life balance (Eby et al., 2005).

Now with the help of **new models of shift work**, these influences on WLB can be positively impacted. Different models have been designed in the last decades and one should consider the practicalities and characteristics at the organization when choosing and implementing one of them. Possible models include a flexible work schedule with flex-time

working, compressed hours, annualized hours, shift swapping and self-rostering (as used at Grolsch, see Veltman (2010) or the self-managed team system at Buurtzorg (Gray et al., 2015; Khamkanya & Sloan, 2009). A rather different model is the fixed forward or backwards rotation schedule (Knauth, 1995; Sallinen & Kecklund, 2010; Van Amelsvoort et al., 2004), which can be used to prevent a negative effect of shift work on employees.

### 5.3.2 Improvements for shift work schedules

Based on the analysis in this research, it was stated that most important variables to influence the WLB of employees are (1) satisfaction with length and intensity of working hours, (2) satisfaction with social aspects of working hours and (3) Worktime Control.

To **improve the satisfaction with the length and intensity of working hours**, the following possible practical improvement points could be implemented. First, to improve satisfaction with weekly working hours, the organization can identify if there are employees who would like to work more or less hours, they could be dissatisfied either way. Furthermore, the amount of over-time should be reduced as much as possible to improve the satisfaction and WLB (Knauth & Hornberger, 2003). Additionally, employees should not work more than 5-7 days in a row and have at least 11 hours between shifts (Knauth & Hornberger, 2003). If this is not possible, the responsible manager should check in with the employees if there are other possibilities to reduce consecutive shifts and to increase rest periods between shifts.

To **improve the satisfaction with the social aspects of working hours**, the following improvements are possible. To increase satisfaction with the amount of annual leave days, it should be investigated further if the annual leave days can be taken within the year they should be taken and if it would be an option to offer more annual leave days (than regulated by the TVöD) to provide above-market benefits. Decreasing the amount of weekend work by sticking to the “every second weekend” rule of the institutions should be focussed on. This makes shifts more plannable for employees. If this is not possible, employers should attempt to provide employees with at least two consecutive days off (avoid single free days). This could be fixed with a rotation schedule (Knauth & Hornberger, 2003; Van Amelsvoort et al., 2004). Shift work schedules should be rather fixed and not changed last-minute, if possible. This will dissatisfy employees (Bambra et al., 2008; Shiffer et al., 2018). More energy should be invested into planning the schedules, rather than “changing them on the go”. Exemptions are sickness of employees, which can never be planned in advance. Shift wishes should be implemented wherever possible. Some institutions already have a list where employees can fill in shift wishes, a few months in advance. These can then be considered when making the schedule for the next month. However, the manager should be aware that considering these shift wishes should be fair and transparent to all employees, as to not dissatisfy them. The same goes for increasing the satisfaction with realized shift wishes.

To **improve the access of perceived control over working time**, or Worktime Control, different improvements for organizations can be proposed. These are naturally to provide employees with more perceived control over working time. This could be done by introducing self-scheduling (Pryce et al., 2006) which will increase employee’s perceived WTC and positively affect general well-being and WLB (Kelly et al., 2011; Nabe-Nielsen et al., 2011). Allowing employees to decide to work from home (although not possible everywhere), was shown to improve WTC and WLB (Geurts & Demerouti, 2003; Grandey & Cropanzano, 1999). Meeting preferences and considering shift wishes, can also improve the perceived WTC and with that, the WLB of employees (Nijp et al., 2016).

### 5.3.3 Concrete advice to the organization

Concrete advice to the management of the company 'HpH' includes recommendations regarding different aspects of shift work schedules and their impact on Work-Life Balance of employees. It should be repeated that, there is "no single optimum solution" (Knauth & Hornberger, 2003, p. 109) but companies can try to implement as many employee-friendly aspects as possible. Main points of advice are summarised in *Table 10* and oriented on the findings in regard to each significant main variable.

*Table 10: Concrete advice to management*

Variable	Finding	Recommendation
Work-Life Balance	WLB is rather low for all respondents (mean= 3.12 of 5)	What can be done to generally improve WLB? <b>New health management at company/ offer more opportunities for employees</b> (systematically and transparent)
	Impact of control variables on WLB (only significant control variable was Gender): being female decreases perceived WLB	Focus especially on offering <b>benefits for female employees</b> to improve WLB (balancing children and work, support during pregnancy, maternity leave, etc.)
Length and intensity of Working Hours	The lower satisfaction with length and intensity of working hours (included indicators: weekly working hours, amount of overtime, number of consecutive working days, time between shifts) leads to lower perceived WLB.	Increase (if possible) the time off between the shifts, decrease (if possible) amount of overtime and number of consecutive working days), adjust weekly hours according to wishes by employees: some might want to increase hours, some might want to decrease hours Organization should ensure a high satisfaction, could be implemented in combination by using a <b>new shift work model</b> (e.g., flexible wish rostering or fixed forward rotation schedule)
Social aspects of working hours	The lower satisfaction with social aspects of working hours (included indicators: amount of annual leave days, weekend work, single free days, realized shift plans, use of shift wishes, realized shift wishes) leads to lower perceived WLB.	Increase (if possible) annual leave days and the use of shift wishes, decrease (if possible) weekend work and single free days (schedule more free days in a row to offer time to recover) Organization should ensure a high satisfaction, could be implemented in combination by using a new shift work model (e.g., flexible wish rostering or fixed forward rotation schedule)
Worktime Control	Lower Worktime Control was found to lead to lower perceived WLB	Provide employees with more perceived control over working time; can be done with <b>self-scheduling</b> , more <b>consideration of shift wishes</b> , and generally giving more responsibility for scheduling to employees. This should be done with caution (risks: no fair, transparent, and equal treatment of all employees if they can decide when to work themselves).
Strain of working schedules (SE tool)	Significant predictor of WLB in combination with satisfaction variables from survey, negatively predicts WLB (higher risk score, lower perceived WLB)	Tool can be used to individually assess whether risk score of employees is critical or not (in combination with survey), <b>re-do analysis</b> in two years to check for improvements

## 5.4 Limitations & suggestions for further research

### 5.4.1 Limitations

The limitations of this research can be categorised into different kinds of limitations: (1) limitations of the method, (2) literature limitations, and (3) general limitations. Firstly, possible drawbacks of quantitative methods, such as a survey questionnaire include a higher needed sample size, self-report of respondents, causality, and oversimplification (forced answers). The answers to the survey are highly dependent on the used survey itself. Another limitation of the used method could be survey fatigue of the respondents, who might receive too many surveys and do not wish to answer more surveys than necessary (see *Appendix 8*).

Secondly, regarding interpretation, a limitation of the research is that maybe highly unsatisfied employees did not fill in the survey and because of that the satisfaction might appear as better/ higher than it actually is. Since this is unknown, it cannot be said for sure. Also, maybe the population the research was aimed at could have been bigger to begin with, providing a bigger sample as well. The response rate of 46% is sufficient to analyse the data but all results should be interpreted with caution, as they represent just a little less than half of the approached employee's opinions. Problems with reliability of the method could be that the answers to the surveys are self-reported by the employees (Smith et al., 1979). This effect can be minimized by also using the SE tool with objective scheduling data. Additionally, it should be mentioned that this research focussed on WLB and therefore excluded other possible outcomes of the shift work schedules such as health or productivity.

Finally, a general limitation to this research is that since employees were highly strained during the ongoing corona pandemic and still are affected by its consequences, the results and perceptions of their work-life balance and overall satisfaction might be distorted. However, since no one can say exactly how long the pandemic will affect employee's worldwide, these results can still be considered in this 'newly normal' situation.

### 5.4.2 Suggestions for further research

Possible future research directions based on this thesis could be to collect more data, which can be done by either approaching a larger sample or by making use of in-depth interviews (qualitative research) to ensure that the real satisfaction is captured. The research would not rely on who answers the survey and who does not. It is difficult to say whether the employees who did not answer the survey are equally satisfied or on average rather more dissatisfied. This could be solved by interviewing employees who seem to be rather dissatisfied with their shift work schedule as well as ones who seem to be rather satisfied. The study could also be insightful at other types of organizations with different characteristics and issues. The survey and SE tool should be further tested in different contexts and in combination and on their own to confirm the findings of this research. Additionally, the study could be repeated after the recommended changes were implemented at the organization, to check for improvements.

## 6 – Conclusion

With the current shortage of specialized employees in the area of public healthcare, the retention of employees has become increasingly important. Different factors of shift work impact the satisfaction and work-life balance of employees in this sector, rather negatively due to the unpredictability and flexibility of schedules. The main research question was “What effects do shift work schedules have on work-life balance of employees in the public healthcare sector?”. Four of the five hypotheses were supported. Main findings (in the combination of both survey and SE tool data) include that there is a significant effect of “Satisfaction with length and intensity of working hours”, “Satisfaction with social aspects of working hours”, “Worktime Control” and “Strain of working schedules” (as measured by the SE tool) on the Work-Life Balance of employees.

A combination of a survey and Sustainable Employability (SE) tool analysis (by the company ‘ModernWorkx’) was used to analyse the possible effect of shift work schedules on WLB at the company ‘Heilpädagogische Hilfe Bersenbrück’. Based on 79 respondents to the survey, work schedules were evaluated into low, middle, and high risk according to the SE tool with the help of hierarchical linear regression for the statistical analysis.

It can be concluded that subjective as well as objective data should be used in combination to measure/ analyse the WLB of employees. The subjective (satisfaction) data seems to differently, arguably better, predict the WLB than the objective data. Further research should include the analysis of qualitative data (interviews) to gather more ideas and gain insights into which aspects seem to have which effects on the employees. Research could also be conducted at larger organizations to ensure a better generalizability of the study.

Practical implications include advice to management and HR department of organizations in regard to reframing and reorganizing the shift planning to self-scheduling, flexible working and/ or a fixed rotation schedule as well as the company’s health management to enable a better work-life balance for their employees. Lastly, organizations should re-analyse the situation after these changes were implemented. It should further be emphasized that there is “no single optimum solution”(Knauth & Hornberger, 2003, p. 109) but organizations can and should try to implement as many employee-friendly aspects as possible. As Seneca once said, *‘It’s not that we do not have time, but that we do not use it well’*.



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## Appendices

### Appendix 1 – Definitions of Work-Life Balance

<b>Definition</b>	<b>Source</b>
From the employee viewpoint: “the dilemma of managing work obligations and personal/ family responsibilities”	(Lockwood, 2003, p. 3)
From the employer viewpoint: “the challenge of creating a supportive company culture where employees can focus on their jobs while at work”	
“the extent to which an individual is equally engaged in – and equally satisfied with – his or her work role and family role”	(Greenhaus et al., 2003, pp. 512-513)
“Positive balance suggests an equally high level of attention, time, involvement, or commitment, whereas negative balance refers to an equally low level of attention, time, involvement, or commitment”	
WLB can be defined as	(Kalliath & Brough, 2008, p. 324)
(1) multiple roles	
(2) equity across multiple roles	
(3) satisfaction between multiple roles	
(4) fulfilment of role salience between multiple roles	
(5) relationship between conflict and facilitation	
(6) perceived control between multiple roles	
“an individual’s ability to meet their work and family commitments, as well as other non-work responsibilities and activities”	(Delecta, 2011, p. 186)
“satisfaction and good functioning at work and at home with a minimum of role conflict”	(Clark, 2000, p. 751)

## Appendix 2 – Categorization of WLB

### *Overview of categorization of Work-Life Balance*

<b>Components</b> (Greenhaus et al., 2003, p. 513)	<b>Forms of WLB conflict</b> (Wöhrmann et al., 2020)	<b>Categories of WLB for this research</b>
Time balance	Time-based conflicts	Balance & conflict of time
Involvement balance	Strain-based conflicts	Balance & conflict of involvement/ strain
Satisfaction balance	Behaviour-based conflicts	Balance & conflict of satisfaction/ behaviour



## Appendix 3 – Review of current literature on effect of shift work schedules on WLB

Title	Findings	Source
<p>Work-life balance of shift workers – Differences across shifts in regards to work-life balance, role overload and other indicators of well-being</p>	<p>→ <b>Assess impact of work schedules and demographic and socioeconomic variables on work-life balance (and role overload for men &amp; women)</b></p> <ul style="list-style-type: none"> <li>• <b>shift work:</b> regular evening schedules, regular night schedules, rotating shifts, split shifts, on call or casual, irregular schedule, other non-day schedules</li> <li>• <b>WLB:</b> self-perceived notion with question “Are you satisfied or dissatisfied with the balance between your job and home life?”</li> <li>• Conclusion: “satisfaction with WLB (...) is related not only to workers’ schedules but also to a complex interaction of hours worked, self-perception and general feelings of well-being” (p. 15)</li> <li>• <i>Gap: apply to public healthcare workers in Germany (now Canada in 2008 in different industries)</i></li> </ul>	<p>(Williams, 2008)</p>
<p>Shift schedule, work–family relationships, marital communication , job satisfaction and health among transport service shift workers</p>	<p>→ <b>compare day workers and shift workers of different systems in terms of rotation speed and shifts worked with regard to work-family and family-work positive and negative spill-over, marital communication style, job satisfaction and health</b></p> <ul style="list-style-type: none"> <li>• Work-family spillover scale was used to measure work-family and family-work positive (facilitation) and negative spillover (conflict) → 16 items with 4 questions for each direction and for each valence</li> </ul> <p>Literature on shift work &amp; WLB</p> <ul style="list-style-type: none"> <li>• Review literature on shift workers and WLB: “scarcity of studies on work-family relationships in shift workers” (p. 122)</li> <li>• “shift work schedules may cause at least 2 forms of such conflict (work-family conflict), i.e. strain-based conflict and time-based conflict” (p. 122)</li> <li>• Marital communication suffers when person works in shifts, negative effect on WLB</li> <li>• There are also positive effects of shift work on WLB: facilitated child care when both parents work in complementary schedules, could help to involve second parent more in child care (p. 122)</li> <li>• Influence of wishes in shift work schedule influence negative effect positively (p. 123)</li> </ul>	<p>(Iskra-Golec et al., 2017)</p>

	<ul style="list-style-type: none"> <li>• “there is a <b>shortage of research on the effect of different working time scheduling on work-family relationship</b>” (p. 129)</li> </ul>	
Impact of working hours on work-life balance	<p>→ importance of research on shift work &amp; WLB</p> <ul style="list-style-type: none"> <li>• “interplay of working hours and work–life balance remains important for companies and their human resource policies” (p.2)</li> </ul>	(Holly & Mohnen, 2012)
Shift Work and Work-Family Conflict: A Systematic Review	<p>→ <b>systematic assessment of the state of the research on the impact of shift work on work-family conflict</b></p> <p>Review literature for (1) shift work, (2) work-family conflict and (3) effect of shift work on work-family conflict</p> <ul style="list-style-type: none"> <li>• One year ago → shows current state of research</li> <li>• unpredictability of shift work is naturally difficult to combine with a good work-life balance</li> <li>• effect of shift work on work-family conflict was reviewed and as commonly expected, irregular and shift works schedules can have a negative impact on the social and family life of employees</li> <li>• literature suggests that there is a significant relationship of shift work with work-family conflict but rather not with family-work conflict</li> </ul>	(Wöhrmann et al., 2020)
Workhours and work-life balance	<p>→ <b>“summarize the scientific literature about the consequences of long and nonstandard workhours and employee influence over workhours on different measures of WLB” (p.14)</b></p> <ul style="list-style-type: none"> <li>• Strong effect found for high amount of work hours and low level of WLB for women</li> <li>• “Non-standard work hours have a negative influence on WLB” (p. 14)</li> </ul>	(Albertsen et al., 2008)
Working on Sundays– Effects on Safety, Health, and Work-life Balance	<p>→ <b>negative impact of working Sundays on the incidence of occupational accidents, health impairments and WLB</b></p> <ul style="list-style-type: none"> <li>• Disadvantages of Sunday-work should be considered when designing shift schedules</li> </ul>	(Wirtz et al., 2011)
Work and family research in IO/OB: Content analysis and review of the literature (1980–2002)	<p>→ <b>very extensive review of literature</b></p> <ul style="list-style-type: none"> <li>• <b>Provides longitudinal review of literature 1980 – 2002</b></li> <li>• <i>narrative review of the articles is presented, organized in terms of the following topical areas: (1) work–family conflict, (2) work role stress, (3) work–family assistance, (4) work schedules, (5) job-related relocation, (6) career and job-related outcomes, (7) gender and the relationship between work and family domains, (8) dual-earner couples, and (9) relationships among life domains</i></li> </ul>	Eby et al. (2005)

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	<ul style="list-style-type: none"> <li>• “Compared to individuals working a regular schedule of days, those working nonstandard workdays (e.g., weekend work) reported less time spent with children and in housework. They also expressed greater complaints about excessive work-to-family conflict and schedule-based work–family conflict.” (p.155)</li> <li>• “negative effect of nonstandard work schedules on family life was moderated by schedule flexibility” (p.155)</li> <li>• “Finally, several contextual factors related to the successful use of these work arrangements including senior management support, a supportive organizational culture, the presence of formal HR policies related to reduced work arrangements, and assistance from HR staff in the implementation and use of such arrangements.” (p.157)</li> </ul>	
Direction of shift rotation among three-shift workers in relation to psychological health and work-family conflict – existing research	<p>→ forward-rotating schedules have a less negative effect on WLB than other rotations</p> <ul style="list-style-type: none"> <li>• Less work-family conflict with forward-rotating work schedule</li> <li>• “emphasize the complexity of valid shift-work research” (p. 154)</li> </ul>	Van Amelsvoort et al. (2004)
The impact of rest breaks upon accident risk, fatigue and performance – importance of rest breaks in shift work	<p>→ Influence of rest breaks can moderate negative effect of shift work on WLB</p> <ul style="list-style-type: none"> <li>• Positive effect of rest breaks, if combined with regular timing of breaks, can improve social relationships at the workplace, decrease in stress</li> </ul>	(Tucker, 2003)

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## Appendix 4 – Factors influencing shift work schedules (literature review)

<b>Source</b>	<b>Factors influencing shift work schedules</b>
Härmä et al. (2015)	Length of working hours (incl. 7 sub-variables) Time of the day (incl. 6 sub-variables) Shift intensity (incl. 7 sub-variables) Social aspects of working hours (incl. 9 sub-variables)
Folkard and Tucker (2003, p. 99)	Number of successive night shifts Length of night shifts Provision of breaks within shifts
Åkerstedt (2003)	Speed of rotation Direction of rotation Time of changeover Quick changeovers Naps Long-term effects
Klein Hesselink et al. (2010)	Maximum number of consecutive night shifts Maximum number of consecutive working days Direction of rotation Positioning of the free time Duration and distribution of working time
Knauth and Hornberger (2003) & Sallinen and Kecklund (2010)	Maximum number of consecutive shifts <ul style="list-style-type: none"> <li>• Night shifts</li> <li>• Morning shifts</li> <li>• Evening shifts</li> </ul> Direction of rotation Sequence of shifts Maximum number of consecutive workdays Duration of shift Time off between two shifts Start and end time of shifts Work on weekends
Wöhrmann et al. (2020)	shift length shift systems shift types rotation system (direction and speed)

## Appendix 5 – Main variables of shift work schedules (Härmä et al., 2015)

The following table is from the study by Härmä et al. (2015). It describes the 29 variables characterizing the four dimensions of working time patterns (Table 2 in the article).

<b>Table 2.</b> Description of 29 variables characterizing four dimensions of working time patterns.	
Working time dimension/variable	Description
<b>Length of working hours</b>	
Weekly working hours	The average weekly (from Monday 00:00 to Sunday 24:00) working hours during the year. Calendar weeks without any work, that is on paid or non-paid leave, were excluded
% of long (>40 hours) working weeks	Proportion (%) of long working weeks: the proportion of calendar weeks of >40 weekly hours of all calendar weeks with work during the year
% of long (>48 hours) working weeks	Proportion (%) of long working weeks: the proportion of calendar weeks of >48 weekly hours of all calendar weeks with work during the year
<b>Shift length (hours)</b>	
% of long shifts	The average length of all shifts during the year in hours Proportion (%) of $\geq 12$ hours shifts/all shifts during the year
Length of night shifts (hours)	The average length of all night shifts (subjects without night shifts excluded) during the year
% of long night shifts	Proportion (%) of $\geq 12$ -hour night shifts/all shifts during the year
<b>Time of the day</b>	
% of early morning shifts	Proportion (%) of early morning shifts /all shifts during the year
% of morning shifts	Proportion (%) of morning shifts /all shifts during the year
% of day shifts	Proportion (%) of day shifts /all shifts during the year
% of evening shifts	Proportion (%) of evening shifts /all shifts during the year
% of night shifts	Proportion (%) of night shifts /all shifts during the year
% of non-day shifts	Proportion (%) of non-day shifts (=early morning, evening, or night shifts)/all shifts during the year
<b>Shift intensity</b>	
No of consecutive working days	The average number of consecutive daily work shifts (without free days) during the year (starting from and ending to a free day or other absence from work)
% of long spells of work shifts	Proportion (%) of >6 consecutive daily work shifts (without free days)/ all spells of consecutive daily work shifts)
No of consecutive night shifts	The average number of consecutive night shifts during the year (subjects without night shifts excluded)
% of long spells of consecutive night shifts	Proportion (%) of >4 consecutive night shift spells during the year / all spells of consecutive daily night shifts
Time between shifts (hours)	The average time between work shifts (hour) during the year (time between shift and free day or other absence excluded)
% of short shift intervals	Proportion (%) of shift intervals of $\leq 11$ hours during the year/ all shift intervals
% of short recovery periods after the last night shift	Proportion (%) of <28 hours recovery periods after the last night shift during the year/ all recovery periods after the last night shift
<b>Social aspects of working hours</b>	
% of annual leave days	Proportion (%) of annual leave days/ annual contract days
% of weekend work	Proportion (%) of Saturday and/or Sunday work/ all week-ends
% of single free days	Proportion (%) of single free days/all free days
Variability of shift starting times	MAD of shift starting times. The mean absolute deviation (MAD) is the average distance of the data set from its mean, calculated as the mean of the absolute deviations about the data's mean (65)
Variability of shift ending times	MAD of shift ending times
Variability of shift length	MAD of shift lengths
% of realized shift plans	Proportion (%) of all realized annual shifts /all planned shifts (based on the comparison of the planned and finalized shift plans)
% of the use of shift wishes	Proportion (%) of wished shifts/all shifts
% of realized shift wishes	Proportion (%) of realized shift wishes /all shifts

Source: Härmä et al. (2015)

## Appendix 6 – Laws about shift work based on ‘TVöD’ (Effertz, 2021)

*Laws about working hours/ shift work/ schedules as regulated by the German ‘TVöD’ (Effertz, 2021)*

<b>Law</b>	<b>Explanation</b>
§6 Abschnitt 2 TVöD – Arbeitszeit/ Working hours (Effertz, 2021, p. 109)	<ul style="list-style-type: none"> <li>• normal full-time vacancy: 39 hours/week (Absatz 1, Satz 1, p.109)</li> <li>• Regular working days: 5 days/week, can be increased to 6 days if necessary (Absatz. 1, Satz 2, p.109)</li> </ul>
Sonderformen der Arbeit/ Special forms of labour (Effertz, 2021, pp. 136-143) - §7 TVöD	<ul style="list-style-type: none"> <li>• Absatz 2 Schichtarbeit               <ul style="list-style-type: none"> <li>○ „Shift work occurs when work is performed according to a shift schedule that provides for the regular alternation of the start of regular working hours“ (§7 Abs. 2 TVöD, p.138)</li> </ul> </li> <li>• Absatz 5 Nachtarbeit               <ul style="list-style-type: none"> <li>○ Different to Arbeitszeitgesetz: here work between 21pm and 6am is meant as night shift (§7 Abs. 5 TVöD, p.140)</li> </ul> </li> </ul>
Arbeitszeitgesetz (ArbZG) (vom 06. Juni 1994 – BGB) → 210 §6 TVöD Anhang 1 (Effertz, 2021, pp. 118-119)	<p>ArbZG Abschnitt 1 (p. 118)</p> <ul style="list-style-type: none"> <li>• §1 Zweck des Gesetzes - To protect rights of employees and regular breaks as well as Sunday and holidays</li> <li>• §2 Begriffsbestimmungen           <ul style="list-style-type: none"> <li>○ Absatz 1: Arbeitszeit – working time from beginning of the work until the end of the work without the breaks</li> <li>○ Absatz 3: Nachtzeit (nighttime) – time between 23pm until 6am</li> <li>○ Absatz 4: Nachtarbeit (night work) – work which is done in at least two hours of the time between 23pm and 6am</li> </ul> </li> </ul> <p>ArbZG Abschnitt 2 (p. 119- 123)</p> <ul style="list-style-type: none"> <li>• §3 Arbeitszeit der Arbeitnehmer – daily working time cannot be more than 8 hours, can be increased to 10 hours if really necessary (p. 119)</li> <li>• §4 Ruhepausen - 30 minutes with work hours of more than 6 hours, 45 minutes with work hours more than 9 hours, can be broken down into 15 minute-breaks (p. 119)</li> <li>• §5 Ruhezeit - minimum of 11 hours between the shifts, can be reduced to 10 hours if an extraordinary reason is present (p. 119)</li> </ul>

Source: Effertz (2021)

## Appendix 7 – Survey

### Opening Statement

You are being invited to participate in a research study titled ‘**Living to work or working to live? – The effects of shift work schedules on work-life balance in the public healthcare sector**’. This study is being done by **Wiebke Spekker** from the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

The purpose of this research study is to analyse the expected effect of different aspects of shift work schedules on work-life balance of employees in the public healthcare sector in Germany, and will take you approximately **5** minutes to complete. The data will be used for the purpose of this master thesis analysis only. Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any question.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. Your answers in this study will remain confidential. We will minimize any risks by storing the data safely and keeping your identity separate from any concrete data about shift schedules and your assessment of satisfaction. The data will be entirely deleted after the research process and will not be handed over to third-parties. The research was approved by the ethical committee of the University of Twente on 20<sup>th</sup> July 2021 with the request number 211061.

**Study contact details for further information: *Wiebke Spekker, w.k.spekker@student.utwente.nl***

#	Question	Answer possibilities
<b>Personnel number</b>		
1	Please fill in your personnel number in the field. This information is necessary as the work schedules are being analysed independently of the survey and will in the end be matched to the outcomes based on this number. The number will in no way be used to assess individual performance or opinions. If you do not recall your personnel number, please fill in your last name, this will later be changed to the number. Any connection to your name or personal data is deleted.	Open question, Text field, 4-5 numbers
<b>Satisfaction with Work-Life Balance</b>		
2	I currently have a good balance between the time I spend at work and the time I have available for non-work activities	5-Likert scale 1=Strongly disagree, 5= Strongly agree
3	I have difficulty balancing my work and non-work activities	5-Likert scale 1=Strongly disagree, 5= Strongly agree reverse scored
4	I feel the balance between my work demands and non-work activities is currently about right	5-Likert scale 1=Strongly disagree, 5= Strongly agree
5	Overall, I believe that my work and non-work life are balanced	5-Likert scale

	1=Strongly disagree, 5= Strongly agree
<b>Satisfaction with shift work schedule</b>	
How satisfied are you with...	
5-Likert scale	
1=Very unsatisfied, 5= Very satisfied	
6	your weekly working hours? See above
7	the amount of over-time you work? See above
8	the amount of early morning shifts (start before 6am) you work? See above
9	the amount of morning shifts you work? See above
10	the amount of day shifts you work? See above
11	the amount of evening shifts you work? See above
12	the number of consecutive working days? See above
13	the time between shifts (hours)? See above
14	the amount of annual leave days? See above
15	the amount of weekend work? See above
16	the amount of single free days? See above
17	the variability of shift starting and ending times? See above
18	the amount of realized shift plans (worked as planned)? See above
19	the use of shift wishes? See above
20	the realized shift wishes? See above
<b>Worktime Control</b>	
To what extent do you have the possibility to...	
5-Likert scale	
1= (Almost) Not at all	
2= To a limited extent	
3= To a reasonable extent	
4= To a high extent	
5= To a very high extent	
21	Determine the starting and ending times of your working day yourself? See above
22	determine yourself when to take a break? See above
23	take leave (day off, holidays) when you want? See above
24	determine yourself on which days to work? See above
25	determine the distribution of your working hours over the work week yourself? See above
26	determine yourself whether to work overtime? See above
<b>Satisfaction with night shift schedule</b>	
27	Do you work on night shifts regularly? MC, one possible answer 1. Yes 2. No – don't show next questions
28	How satisfied are you with.... 5-Likert scale 1=Very unsatisfied, 5= Very satisfied
29	the length of night shifts (in hours)? See above



30	the amount of overtime during night shifts?	See above
31	the amount of night shifts you work?	See above
32	the number of consecutive night shifts?	See above
33	the recovery period after the last night shift (amount of time off after last night shift in a row)?	See above
<b>Demographic information</b>		
34	Which gender do you mostly identify with?	MC, one possible answer 1. Male 2. Female 3. Other/non-binary 4. Prefer not to say
35	In which year were you born?	Text field, 4 numbers
36	Which marital status best describes your situation?	MC, one possible answer 1. Single 2. In a relationship 3. Prefer not to say
37	Do you take care of someone?	MC, one possible answer 1. No 2. Yes, children under 12 years old 3. Yes, children above 12 years old 4. Yes, parents/ grandparents that need help
38	Which institution is your main workplace?	MC, one possible answer 1. Haus am Bokeler Bach 2. Haus an der Möhringsburg 3. Haus Quadenort 4. NPZ 5. GGW
39	Which of the following best describes your position at the company?	MC, one possible answer 1. Management of institution ('Einrichtungsleitung') 2. Administration 3. Fachkraft 4. Hilfskraft 5. Praktikant/In/ FSJ/etc.
40	How many years have you already been working at the company?	MC, one possible answer 1. Less than one year 2. Between 1 and 3 years 3. Between 4 and 7 years 4. Between 8 and 10 years 5. Between 11 and 15 years 6. More than 15 years

## Appendix 8 – Conversation Notes ‘HpH’

### Appendix 8.1 – Conversation Note 1 – Management ,Living & Care‘

#### Personal information

- Background: Nursing education
- Until last year: manager of sub-area, structure was different before
- Manager of the area ‘Living & Care’ since April 2020
- Now responsible for all institutions and facilities in this area of the company

#### General information about company ‘HpH’

- Normally full-time employees have 39 hour work week
- In total around 1200 employees, in ‘Living & Care’ area around 450 employees
- By law: always need one ‘*Verantwortliche Pflegefachkraft*’ (responsible care specialist) (also called ‘*Pflegedienstleitung*’ = nursing services management) in each institution, need to have specialised training and studies to be able to fill the position
- Problem in care industry: not money as that is mostly standardized and shift workers receive extra bonuses but rather psychological stress/strain is more the problem of why employees are not satisfied and want to leave the industry
- Idea: what works better? Is teams organized themselves (e.g. Buurtzorg: self-managed teams) or if clear hierarchy and shift planning is done for employees? → clear problem statement of company

#### Overview company and sub-divisions with all kinds of institutions and facilities

- Based on care necessity (from high to low):
  - Neurological Care Institution (‘NPZ’)
  - Special Living Institutions (‘besondere Wohnformen’)
  - Assisted Living (‘Wohnassistentz’)
  - Independent shared housing with assistance (‘Wohngemeinschaften mit Betreuung’)

Institutions	Sub-Institutions	Explanations
Neurological Care Institution (‘NPZ’)		40 residents with acquired brain damage (coma vigil, accidents, paralysis, etc.)
Special Living Institutions	Haus am Bokeler Bach	42 residents with different kinds and levels of disabilities, Mostly assisted living (but also partially care for residents)
	Haus an der Möhringsburg	16 residents with focus on autism disorder
	Haus Quadenort	38 residents with mental and multiple impairment Based on old farm outside of the city Especially for elderly people
Assisted Living		Different institutions for different focus: mental/ physical impairments, residents are living more independent than in other living institutions, assisted where needed: psychological help, pedagogical assistance and/or care
Independent shared housing (with assistance)		Help persons with impairments who live on their own with daily needs, but no regular care or assistance needed, no supervision 24/7

## Appendix 8.2 – Conversation Note 2 – HR-Controlling

### Pflegegrade

- Based on grade/ severity of disability/impairment
- Normally from 1-5
- Based on this: calculation for employees
  - 1:3.3 for Pflegegrad 1 etc.
  - Tells you how many employees you need for each client/resident

### 'Vergütungsvereinbarung'

- Per resident
- Per level of disability
- Per day (example: 30,34€/ month and resident)

### Vacation/ Holidays

- Normally 30 days/ year
- Extra vacation days for employees who work in shifts §28 TVöD → quartile of the year +1 vacation day

### 'Schichtzulage'

- Extra payment for employees who work in shifts (weekend, nights, shifts)
- Payment as money with salary

### Appendix 8.3 – Conversation Note 3 – Visit to ‘Haus am Bokeler Bach’

#### Background information about institution (website/ intranet)

- Support and assistance in all areas of living (and care where needed) of 42 residents with different kinds of impairments → a permanent home for all residents!
- Individual planning per resident according to necessities
- Close to the city center of Bersenbrück (small town in region of Osnabrück, Germany)
- 4 groups → 2 groups with 10 residents and 2 groups with 11 residents
- Kitchen, Living room and outside areas are shared, bedrooms and bathrooms are planned per resident (two residents per bathroom)
- Always have two employees per group present (4x2 in total for whole institution per shift)
- In total: 43 employees + 2 interns/FSJ
- Important: all residents also have a second living area means they also go to work or are cared for somewhere else over the day
- Focus of employee work (Source: B 4.3.1.1. Konzept Wohnstätte Bokeler Bach, p. 6)
  - Medical care (e.g. doctor appointments, keep track of health status of residents)
  - Pedagogical work coordination & implementation (e.g. offer talks, clarify needs, work on conflicts, keep contacts)
  - Keeping an eye on money matters (e.g. administration and control of cash, consultation of expenses)
  - Promote recreation (e.g. stimulate individual possibilities, provide educational opportunities)

#### Different shifts and explanations

##### Morning shift

- Mostly start at 6am
- 2 employees per group (4 groups → 8 employees per shift)
- 1 Fachkraft (FK) per shift for whole institution (FK= Specialised worker)
- Waking up residents, breakfast, getting ready for work, provide support
- Around 07:30am until 08:30am: bus comes and takes residents to work
- Short morning shift: until 09:00h
- Long morning shift: until 14:15h (Specialised worker)
- Tasks of specialised workers (*Fachkraft*)
  - Reports
  - Responsible for all four groups, doctors’ appointments, special tasks and care
- Tasks of support staff (*Hilfskraft*)
  - Tasks at home, kitchen and housekeeping, cleaning, laundry, etc.
  - Groceries, small tasks e.g. post office
- Special morning shift Tuesday & Thursday: 06:00-15:00h – team meeting 13-15h

##### Evening shift

- Normally: 14h or 15:30h, when team meeting: start 13h
- Different shifts (always minimum 1 FK, rest are support employees (Helfer))
  - 14-20h
  - 14-21:30h
  - 15:30-20h
  - 15:30-21:30h
- Schedule for residents
  - Wed & Friday: 14:30h residents come back from work

- Mon, Tue & Thu: 15:30h residents come back from work
- Coffee, tea, break (down-time), care for residents
- Residents have duties: kitchen, laundry, preparation of dinner (18h)
- Preparations for next day, care for residents, free time
- One employee finishes at 20h (bedtime)
- 21:15h hand-over

#### Night shift

- Within the week: 21:15h – 06:15h
- In each shift: one person for all four groups
- Separate employees for night shifts
- 24h rest period between shifts
- No fixed rotation of night shifts (could be an idea, but difficult in practice)
- Employee does not sleep!
- Tasks
  - Toilet assistance for residents/ Care for residents
  - Laundry/ Housekeeping tasks
  - Social interaction with residents
  - Safety
  - More tasks when residents are older
- If necessary: possible to call more employees
- Weekend night shifts
  - Friday & Saturday 21h- 07:15h
  - Sunday 21h – 06:15h

#### Weekend shifts

- each employee works every second weekend (take turns with morning and evening shifts)
- codes for weekend work: WS, WF or WF, WS
- never have both morning or both evening shifts
- extra rule for employees: shorter rest periods!
- Day shift - Only on weekends
  - 7h-14:15h (WF)
  - 14-21:15h (WS)
- Morning shift
  - Extra employee (morning shift) 08:30-13:00h (Z1)
  - Or sometimes 09:30-20:00h (W1)
- Evening shift
  - 14-20h (S2)
  - 15:30-20h (S3)
  - 15:30-21:15h (S1)

#### Team meetings

- General team meeting to discuss each resident from each group, meetings per group
  - Every Tuesday and Thursday from 13:00-15:00h
- Dienstbesprechung
  - Only specialised workers
  - Every second and fourth Wednesday in the month
- Nachtwachenbesprechung
  - Nur FK's and one Hilfskraft

- Third Wednesday a month
- Besprechung mit Tagesstätte
  - Last Monday in the month
  - Separate schedule plannings
  - Separate from institution → no shift work but daily care and assistance of elderly residents

### **Shift schedule planning**

- Always plan for the whole month
- Published 15th of month before
- Different weekly hours of employees, most: 30-33 hours
- December: minimum 20 days of vacation days planned for next year
- FK-Mangel: from July three more employees, then all shifts are sufficiently covered
- 15th of 2 months before: employees can add wishes
- Normally work 5 days/week, if working on weekends: only 3 days/week

### **General information about shift work in healthcare**

- Breaks are different than in administration: Pädagogische Pause= pedagogical break
  - Means you stay on site for your break
  - Until 6 hours of work – no break
  - From 6 hours of work – 15 minutes
  - From 9 hours of work – 30 minutes

## Appendix 8.4 – Conversation Note 4 – Visit to ‘Neurologisches Pflegezentrum/ NPZ‘

### General information

- Facility for long-term neurological rehabilitation (phase F), residents need full care (neurological damage)
- 24/7 care institution
- Opened in 2008, started with 32 residents, 2018: additional places built – 40 residents (in two groups) from age of 16 and older

### Employees

- Normally: employees have 39 hours a week (full-time)
- Total of 70 employees
- Each employee has one day free/ week, and each second weekend
- Employees do not rotate between day and night
- Employee wishes and needs are considered: children, illnesses (diabetes), etc., employees can swap shifts with colleagues if they want, should inform management
- Employees are fixed per group: connection to residents, information flow
- Directly not allowed to work when pregnant
- Over-time work between 0-50 hours is normal
- Corona: November 2020, 6-7 employees in quarantine, relatively mild impact: but more work due to testing, mentally difficult for employees because of extra responsibility
- 70% specialised workers (normally work 30-35 hours/week), 30% support employees (normally work 20-30 hours/week)
- Important to retain employees: shortage of employees

### Shift planning

- Morning shift, 6-13h, 8 employees, 4x per group
- Evening shift, 13-20h or 12:15-20:30h, 8 employees
- Day shift, 7-15h, housekeeping tasks etc.
- Night shift, 20:15-06:15h
  - full care as well, 3 employees per night shift (1x specialised worker for each group and one support employee who helps at both groups, that one is also working day shifts)
  - mostly jobbers (450€), 3 nights/ month
  - 1 employee works 7 days in night shift every two weeks, decided for this!
- Weekend shift
  - Week before weekend shift: always work evening shift
  - Employees decide for themselves who works morning and evening shifts in weekend
  - Sometimes work at night as well

### Information from website/ intranet

- The Neurological Care Center (NPZ) provides care, support, and assistance to people with acquired severe and most severe brain damage
- Services are aimed at adults from the age of 16 with pronounced neurological damage, in particular due to strokes and other cerebral vascular diseases, damage due to acute oxygen deficiency (hypoxic brain damage, e.g. cardiovascular arrest), traumatic events (e.g. consequences of accidents), inflammatory processes (e.g. encephalitis or polyradiculitis), tumor diseases of the central nervous system (CNS)
- In accordance with scientifically recognized care models, resident-oriented, case-related care (case management) is the main focus

## Appendix 8.5 – Conversation Note 5 – Visit to ‚Haus an der Möhringsburg‘

### General information

- Opened in 2007, not many changes in residents!
- 3 groups with 6 residents, focussed on autism
- In total have 18 residents with special focus on autism (need for assistance for basic tasks, support in daily living situations, offer work at institution as well, provide structure to residents, need for less stress to concentrate and focus on what is most important)
- “What helps” persons with autism: clear structure and clear answers
- Residents: between 20- 30 years old (mostly), some are 45-50 years old

### Employees

- In total 35 employees for day shifts
- In total 13 night on-call shift employees
- Different employees for night and day shifts (do not rotate) – rotation could be an idea, would make schedule planning more clear
- Team meetings
  - 1 meeting per team per month (3 teams + 1 team night workers)

### Shifts

- 6 employees in every shift (+1 for one resident only) – always at least one specialised employee per shift
- Between 07:00 and 20:45h at least 2 specialised employees on whole property (more specialised employees than in other institutions because of high specialization of residents)
- Morning shift
  - Monday-Thursday 7-15:30h
  - Friday 7-14:15h
  - Until 9h in living spaces, then start working in local working stations
- Evening shift
  - Monday- Thursday 15:15h-20:45/22:00h
  - Friday 14-22h
- Night shift
  - 21:45-07:00h
  - Always two employees, active part of shift until around 23h
- Weekend shift
  - Morning: 7-14:15h, Second part 8-14:15h
  - Evening 14-22h
  - Every second weekend shift



## Appendix 8.6 – Conversation Note 6 – HR Training/ Development/Recruiting

### General information

- Public company: finances are difficult
- Want to offer more possibilities for employees who take care of children or elderly persons in their family → improve work-life balance in shift work!
- Difficult: surveys! Many employees are over-saturated with them and do not want to answer more

### Possibilities for employees

- Flexible part-time possibilities (workweek: 3-4 days)
- Employees can add preferences for shift schedules
- Employee representation: 'MAV' and 'Betriebsrat'
- Special employees as counsel for employees with conflicts/ problems
- BGM (Berufliches Gesundheitsmanagement) – mandatory because of TVöD
  - Fitness programm (sponsored) → Hansefit, Businessbike
  - Lunch break program: sports
  - BEM (Berufseingliederungsmanagement)
  - Medical checks (Arbeitsmedizin – G37)
- Betriebsfest: event every 2 years for all employees
- Surveys
- Talks/ consultations with employees
- Onboarding process (will be updated at the end of 2021)
- Specified profiles for each position are available for every employee
- LOB – Leistungsorientierte Zahlung → payment based on performance

### Benefits for employees from website/ intranet

Benefit	Explanation
Family & Work	<ul style="list-style-type: none"> <li>• good work-life balance through</li> <li>• flexible part-time options</li> <li>• company pension plans</li> <li>• special leaves</li> <li>• annual bonus (November)</li> <li>• certification family-friendly employer</li> </ul>
Development possibilities	<ul style="list-style-type: none"> <li>• Trainings</li> <li>• Regular employee surveys</li> <li>• Appraisal interviews</li> <li>• Performance-related pay</li> </ul>
Company health management system	<ul style="list-style-type: none"> <li>• occupational medicine</li> <li>• company integration management</li> <li>• company fitness in cooperation with HanseFit</li> </ul>

Source: HpH-BsB (2021)

## Appendix 8.7 – Conversation Note 7 – Visit to ‘Haus Quadenort’

### **Overall information about shift work in public healthcare**

- Unattractive industry for employees
- Difficult for younger employees because of shift work
- Intrinsic motivation is crucial!

### **Residents at this institution**

- Young: disabilities, older residents: need more care
- More younger residents for many years
- Psychological and social disabilities
- Need more employees
- Group 1: 15 residents
- Group 2: 13 residents
- Group 3: 12 residents
- Also have a “Day-Care” for older residents (also from outside)

### **Shifts**

- Day/ night separate employees
- No fixed rotation: could be an idea but difficult to plan for employees, prefer wishes
- Morning shifts, short: 6-9h, long: 6-14h, 2 employees in each group= 6 employees/shift
- Evening shifts, 14-21h, 3 employees
- Night shifts, 21-6h, 1 employee

### **Employee data for institution**

- All together: 5 employees who work night shifts
- Total employees/ group – Group 1: 11x, Group 2: 9x, Group 3: 11x
- Most of them are specialised workers

## Appendix 9 – Company structure ‘HpH’

The following company areas are present at ‘HpH’. This research focused on the area of ‘Living & Care’ as this is the only area where shift work is present. Left: English translation, Right: German original

<b>Company Areas</b>	<b>Bereiche des Unternehmens</b>
Pre-school education and therapy	Vorschulische Förderung & Therapien
School education and assistance	Schulische Förderung
Work rehabilitation	Berufliche Rehabilitation
<b>Living &amp; Care</b>	<b>Wohnen &amp; Pflege</b>
Service & Administration	Service & Verwaltung
Consultation & Assistance	Beratung & Begleitung

Source: (HpH-BsB, 2021)

## Appendix 10 – Information on Sustainable Employability tool by ModernWorkx

### Physical strain:

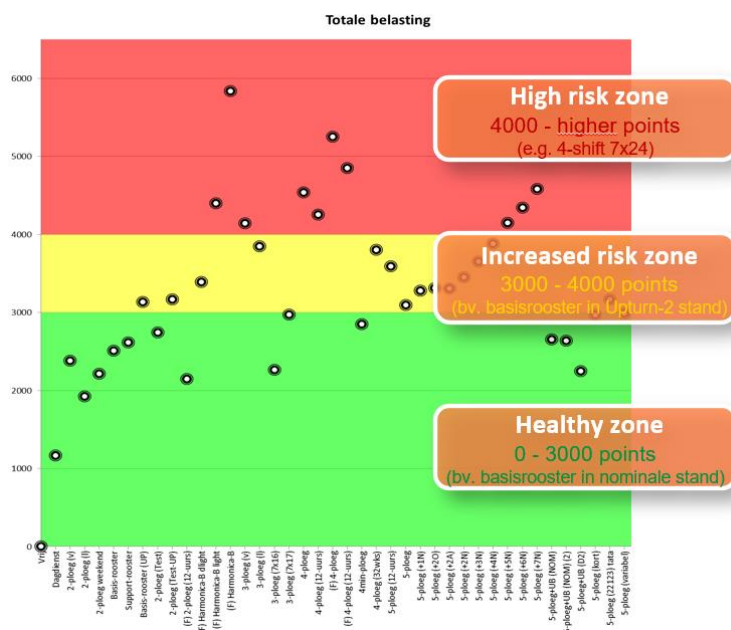
1. night shifts
2. series of night shifts
3. early shift starts
4. shortened rest period between shifts
5. amount of free days between sequences
6. number of different shifts
7. late shift endings
8. long sequences (> 40 hrs)
9. rotation direction
10. sequence length
11. rotation speed
12. broken shifts

### Social strain:

13. half working weekends
14. whole working weekends
15. number of evening shifts
16. predictability
17. unpredictability of schedule
18. consecutive period from home
19. possibilities for care taking tasks

### Filters:

1. workweek
2. shift length
3. individual influence
4. nature of work
5. travelling time
6. chrono type
7. need for care taking tasks



Duurzame inzetbaarheid score		Rooster:		5-ploeg voorwaarts		
	eenheid	waarde	score	gewicht	gewogen score	
<b>Start waarde</b>						<b>1036</b>
<b>Fysieke belasting</b>						<b>1397</b>
1	nachtdiensten	[#/yr]	73	73	12.0	876
2	nachtdienst reeksen	[#]	2.0	31	10.0	306
3	vroege opkomsten (voor 07:00 uur)	[#/yr]	0.0	0	6.0	0
4	verkorte rusttijd tussen 2 diensten	[#/yr]	0	0	6.0	0
5	vrije dagen tussen twee dienstreeksen	[days]	3.0	0	6.0	0
6	verschillende diensten	[#]	3	20	4.0	80
7	laat vertrekken (na 23:00 uur)	[uur/yr]	36	23	4.0	94
8	uren per reeks (>40 uur)	[uur/yr]	291	23	4.0	93
9	rotatierichting	[-]	voorwaarts	-21	4.0	-86
10	reeks lengte	[days]	6.0	40	4.0	160
11	rotatiesnelheid (alleen voor bijzonder dien: [-]	[-]	snel	10	3.0	30
12	gebroken diensten	[#/yr]	0	0	3.0	0
→	effect filters					-155
<b>Sociale belasting</b>						<b>598</b>
13	halve weekenden	[#/yr]	21	42	4.0	168
14	hele weekenden	[#/yr]	21	42	7.0	294
15	avonddiensten	[#/yr]	73	48	4.0	192
16	voorspelbaarheid	[-]	onregelmatig	30	4.0	120
17	onvoorspelbaarheid in rooster	[-]	0-5%	0	4.0	0
18	aaneengesloten periode van huis	[days]	0-1 dagen	0	4.0	0
19	mogelijkheid zorgtaken	[uur/yr]	2132	-14	7.0	-98
→	effect filters					-78
<b>Totale belasting</b>						<b>3031</b>

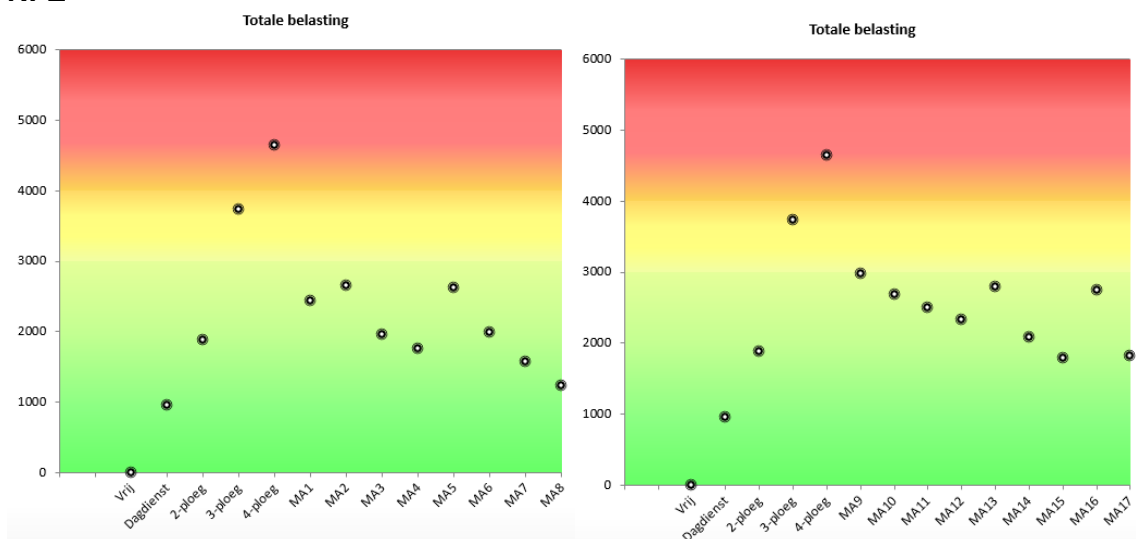
Source: (de Leede, 2019; de Leede & de Jager, 2018)

## Appendix 11 – WTC Access Scale (by Nijp, 2016)

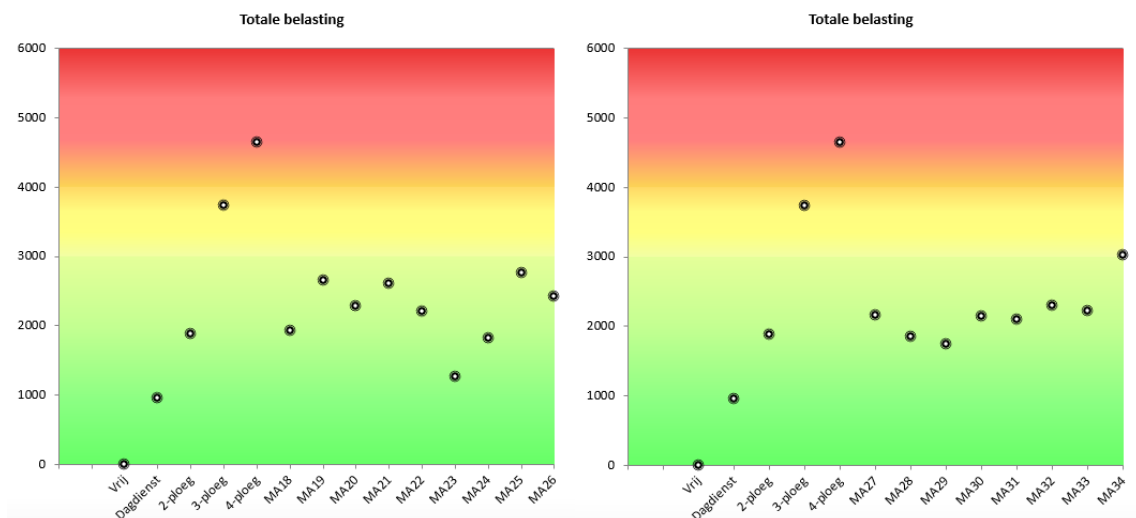
<b>WTC Access (<math>\alpha = .88</math>)</b>	
To what extent do you have the possibility to ..	
1 <sup>a</sup>	.. determine the starting and ending times of your working day yourself?
2 <sup>a</sup>	.. determine yourself when to take a break?
3 <sup>a</sup>	.. take leave (day off, holidays) when you want?
4	.. determine yourself on which days to work?
5	.. determine the distribution of your working hours over the work week yourself?
6	.. determine yourself whether to work overtime?

## Appendix 12 – Results from SE tool

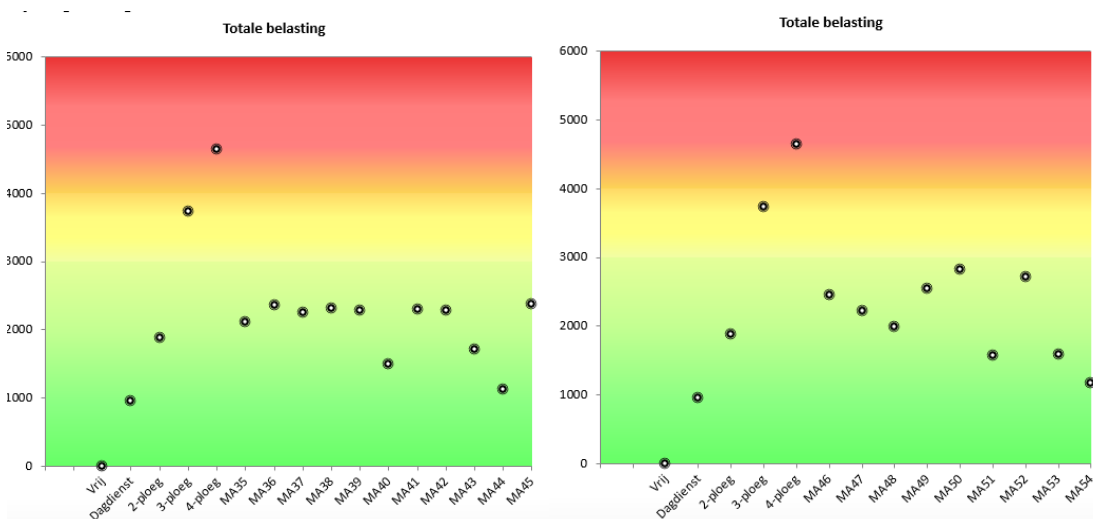
### NPZ



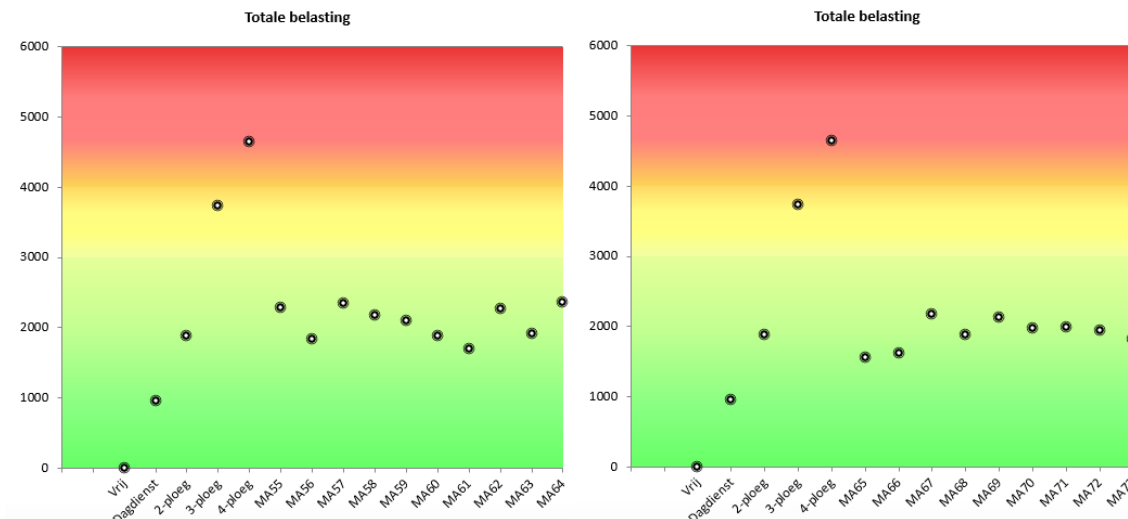
### Quadenort



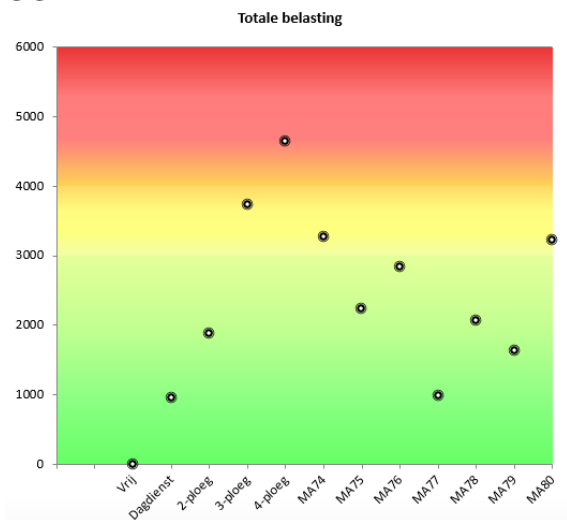
### Bokeler Bach



### HadM

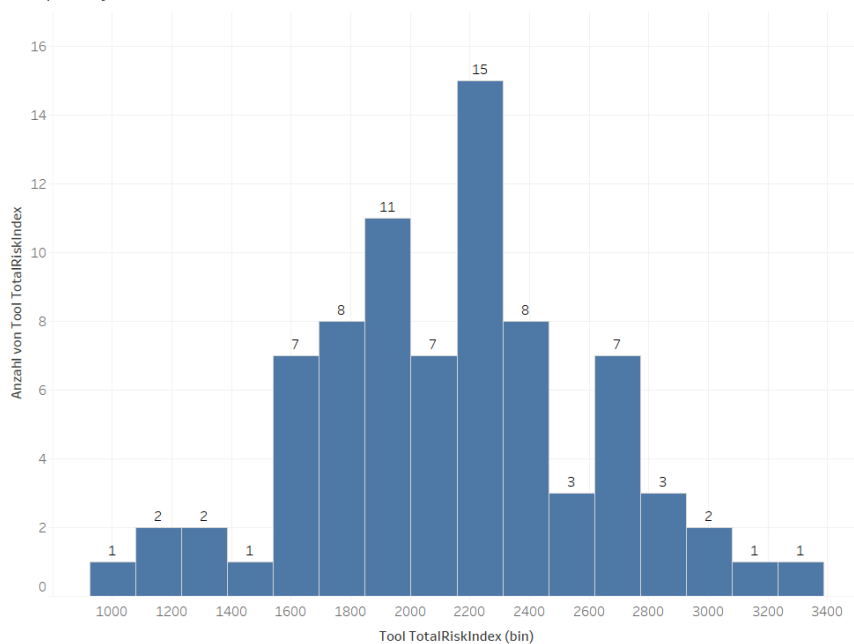


### GGW

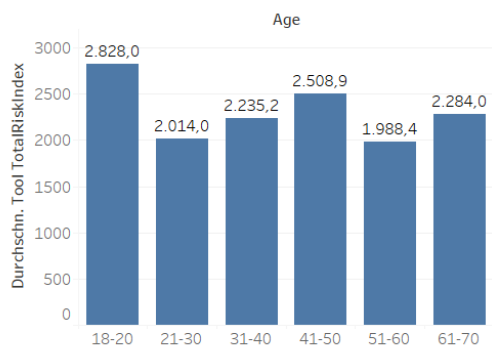


### Overall

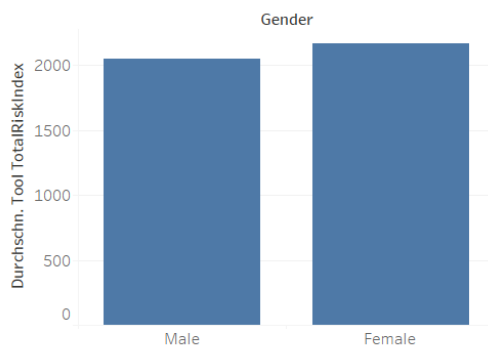
Frequency



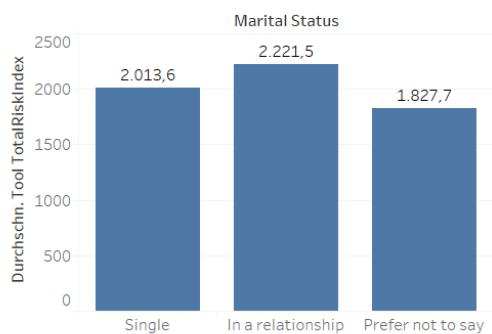
RiskIndex\_Age



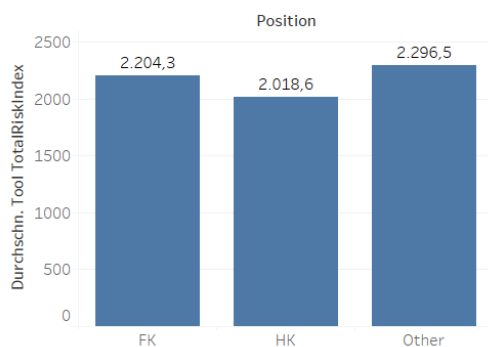
RiskIndex\_Gender



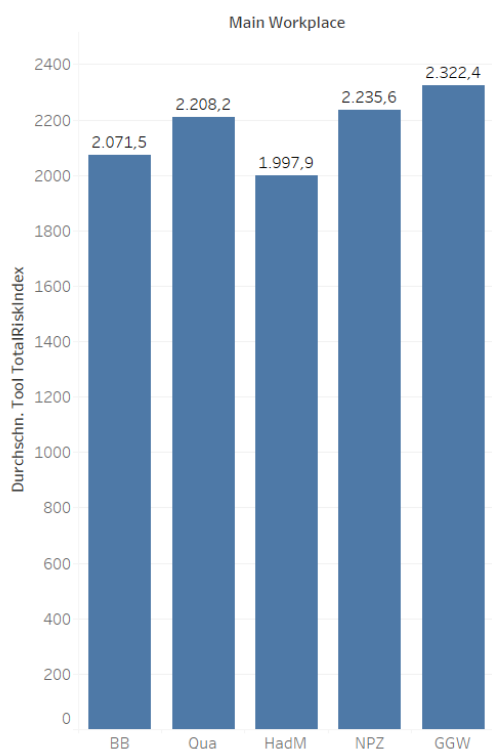
RiskIndex\_Marital status



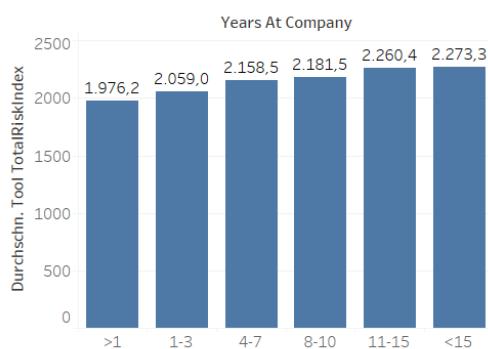
RiskIndex\_Position



RiskIndex\_Institution



RiskIndex\_Yearsatcompany



RiskIndex\_NightShift

