

# Work Engagement in High-Risk Work Environments: The Roles of Work-Family Conflict and Job Demand-Control Characteristics among Energy Sector Employees

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## Abstract

This study examined the predictive effects of work-family conflict dimensions (work-to-family conflict and family-to-work conflict) and Karasek's job characteristics (workload, skill utilization, and decision latitude) on the work engagement dimensions of vigor and dedication among employees in the energy sector. The study was conducted with 579 employees working in an energy company located in Zonguldak, Türkiye. Data were collected using the Work-Family Conflict Scale, the Utrecht Work Engagement Scale (UWES), and Karasek's Job Content Questionnaire (JCQ). Correlation and multiple regression analyses were performed to examine the relationships among the study variables. The findings indicated that work-family conflict was negatively associated with vigor and dedication, whereas decision latitude and skill utilization were positively associated with both dimensions. Decision latitude emerged as the strongest predictor of vigor and dedication. In contrast, workload did not demonstrate a significant relationship with either vigor or dedication. Work-to-family conflict was negatively associated with employees' motivational investment in their work. Overall, the findings suggest that employees' levels of vigor and dedication are associated not only with work-related stressors but also with organizational resources such as autonomy, participation in decision-making processes, and opportunities for skill utilization. The study contributes to the literature by examining work-family conflict and Karasek-based job characteristics together within a high-risk occupational context.

## Keywords

Work Engagement, Work-Family Conflict, Job Demand-Control Model,

## 1. Introduction

Rapid technological change, increasing operational complexity, and intensified production systems have made employees' psychological well-being and work-related attitudes increasingly important in contemporary organizations. These issues are particularly critical in high-risk sectors such as the energy industry, where heavy workloads, shift-based working systems, and operational safety pressures may substantially affect employees' motivation and work-related psychological investment.

Work engagement represents employees' positive psychological connection with their work and is associated with higher motivation, psychological well-being, organizational commitment, and job performance (Bakker & Demerouti, 2008; Schaufeli et al., 2002). Research indicates that psychosocial working conditions, particularly job demands and organizational resources, play a central role in shaping employees' work engagement levels (Bakker & Demerouti, 2017).

Among these psychosocial factors, work-family conflict has been identified as an important predictor of negative employee outcomes. Work-family conflict emerges when work and family responsibilities become incompatible and may reduce employees' psychological energy and motivation toward work (Greenhaus & Beutell, 1985). Previous studies have shown that work-family conflict is associated with higher stress and burnout and lower levels of work engagement and job satisfaction (Allen et al., 2000; French et al., 2018).

In addition to work-family conflict, job characteristics such as workload, skill utilization, and decision latitude may also influence employees' work engagement. Particularly in demanding occupational environments, employees' perceptions of autonomy and control over work processes may function as important organizational resources supporting motivation and psychological well-being.

Although previous studies have examined the relationship between work-family conflict and work engagement, studies simultaneously addressing work-family conflict together with Karasek-based job characteristics remain limited, particularly in high-risk industries. Furthermore, empirical evidence focusing specifically on employees in the energy sector remains relatively scarce despite the demanding nature of this occupational environment.

Therefore, the present study aims to examine the predictive effects of work-family conflict dimensions (work-to-family conflict and family-to-work conflict) and Karasek's job characteristics (workload, skill utilization, and decision latitude) on the work engagement dimensions examined in this study, namely vigor and dedication. By focusing on employees working in the energy sector, the study seeks to contribute to the literature on occupational psychosocial factors and provide practical implications for organizational policies aimed at improving em-

employee well-being and these motivational dimensions of work engagement.

## 2. Conceptual Framework

### 2.1. The Concept of Work Engagement

Work engagement is defined as a positive, fulfilling, and work-related psychological state that employees develop toward their jobs (Schaufeli et al., 2002). Within the framework of positive organizational behavior, the concept of work engagement explains not only employees' level of task performance but also their levels of energy, motivation, and psychological investment in their work. Particularly in today's working life, increasing competitive conditions, intense job demands, and psychosocial risk factors have made employees' psychological attachment to their work a critical variable in terms of organizational productivity.

In earlier studies, work engagement was conceptualized as employees' physical, cognitive, and emotional involvement in their work roles. However, the theoretical framework of the concept has largely been shaped by the approach developed by Schaufeli and Bakker. According to this approach, work engagement consists of three main subdimensions: vigor, dedication, and absorption (Schaufeli et al., 2002). The vigor dimension refers to employees' high levels of mental resilience and motivation toward their work, whereas the dedication dimension reflects employees' perceptions of their work as meaningful, important, and valuable. The absorption dimension, on the other hand, is associated with employees' intense concentration on work processes and their full psychological involvement in their jobs.

In the present study, work engagement was evaluated based on the subdimensions of vigor and dedication. Accordingly, all references to work engagement in the analyses and interpretation of findings should be understood as referring to these two dimensions rather than the full three-dimensional UWES structure. Vigor refers to employees' levels of energy, vitality, and motivation toward their work, whereas dedication reflects the level of psychological attachment that employees develop as a result of perceiving their work as meaningful. Particularly among employees in the energy sector, where high-risk and intensive working conditions prevail, emotional attachment to work may have important consequences for both employee well-being and occupational safety.

The literature indicates that work engagement is positively associated with employee performance, organizational citizenship behavior, job satisfaction, and psychological well-being (Bakker & Albrecht, 2018). Employees with high levels of work engagement are reported to exert greater effort in achieving organizational goals, participate more actively in problem-solving processes, and derive higher levels of satisfaction from their jobs. Conversely, low levels of work engagement have been associated with burnout, turnover intention, and psychological strain (Bakker et al., 2014).

The concept of work engagement is frequently compared with burnout. However, contemporary studies suggest that work engagement is not merely the op-

posite of burnout, but rather an independent construct explaining employees' positive psychological states toward their work (Maslach & Leiter, 2016). In this regard, work engagement is considered to be closely related to the psychological and organizational resources available to employees.

Recent studies have shown that work engagement is associated not only with individual characteristics but also with psychosocial factors such as workload, job control, managerial support, and work-family balance (Lesener et al., 2019). In particular, according to the Job Demands-Resources (JD-R) model, high job demands are generally associated with lower levels of work engagement, whereas organizational resources such as job control, social support, and decision latitude are generally associated with higher levels of motivation and psychological attachment to work (Bakker & Demerouti, 2017). This situation may become even more pronounced among workers in high-risk industrial settings, where heavy workloads, shift-based working systems, and operational risks are common.

Although previous studies have examined the relationships among vigor and dedication, work-family conflict, and job characteristics, studies simultaneously addressing work-family conflict together with Karasek-based job characteristics remain limited, particularly in high-risk industries. In particular, the limited number of studies conducted among employees in the energy sector increases the theoretical and practical significance of the present study.

## 2.2. Work-Family Conflict

Work-family conflict is defined as a form of role conflict that emerges when the responsibilities arising from individuals' work and family roles become incompatible with one another (Greenhaus & Beutell, 1985). Based on role theory, this approach suggests that individuals may experience conflicts in terms of time, energy, and behavioral expectations due to occupying multiple social roles simultaneously. The negative impact of work-related demands on family life, or conversely, the difficulties created by family responsibilities in work processes, constitute the basis of work-family conflict.

In modern working life, increasing workloads, long working hours, shift-based working systems, and time pressure make it difficult for employees to maintain work-family balance. Particularly in sectors such as the energy industry, where operational risks are high, employees are exposed to intense job demands, which may increase work-family conflict (French et al., 2018). According to Conservation of Resources (COR) theory, individuals strive to protect their time, energy, and psychological resources. Intense demands arising from work and family roles may lead employees to experience resource depletion, thereby triggering stress, burnout, and psychological strain processes (Hobfoll, 1989).

Work-family conflict is reported to have significant effects on employees' psychological well-being. The literature indicates that work-family conflict is positively associated with stress, burnout, and turnover intention, while being negatively associated with work engagement and job satisfaction (Allen et al., 2000).

Contemporary studies also demonstrate that high job demands may lead employees to experience role conflict within their family lives, which may negatively affect their motivation toward work (French et al., 2018).

### **2.2.1. Work-to-Family Conflict**

The dimension of work-to-family conflict refers to the negative effects of work-related demands on family life. Heavy workloads, shift-based working systems, long working hours, and time pressure may make it difficult for employees to fulfill their family roles. In particular, energy sector employees may be unable to spend sufficient time with their family members due to irregular working schedules, which may increase their levels of psychological stress (Babic et al., 2022).

The depletion of employees' physical and psychological resources due to high job demands may cause work-related stress to spill over into family life. This situation may lead employees to experience tension in family relationships, increased psychological exhaustion, and reduced motivation toward work. The literature suggests that work-to-family conflict may be associated with lower levels of vigor and dedication and may accelerate burnout processes (French et al., 2018).

### **2.2.2. Family-to-Work Conflict**

The dimension of family-to-work conflict refers to the effects of family-related responsibilities and pressures on work life. Family responsibilities, caregiving obligations, economic problems, or family-related stressors may make it difficult for employees to focus on work processes and may negatively affect their performance.

In particular, decreases in employees' psychological energy levels may be associated with lower levels of vigor, dedication, and work-related motivation (Michel et al., 2011). In addition, family-related conflicts may negatively affect employees' cognitive attention processes and increase the risk of making errors. This issue becomes particularly important among employees in high-risk sectors, where attention and operational safety are critically important.

Research demonstrates that work-family conflict has significant implications for employees' psychological well-being. In this regard, work-family conflict may be associated with lower levels of vigor, dedication, motivation, and psychological attachment to work. Consequently, employees experiencing higher levels of family-to-work conflict may find it more difficult to maintain the positive motivational states that support effective functioning in demanding work environments.

## **2.3. Karasek's Job Demand-Control Model**

The Job Demand-Control Model developed by Karasek is one of the most influential theoretical models explaining psychosocial risk factors in working life (Karasek, 1979). The model proposes that employees' exposure to job demands and their level of control over work processes are key determinants of employee health, stress levels, and psychological well-being. Within the model, job demands

refer to factors that create psychological pressure on employees, such as workload, time pressure, and work intensity, whereas job control refers to employees' levels of decision-making authority and their ability to utilize their skills in work processes.

According to Karasek, work environments characterized by high job demands combined with low job control may create intense stress and psychological strain among employees. In contrast, employees' ability to exercise control over work processes, participate in decision-making mechanisms, and utilize their skills may reduce the negative effects of stress (Karasek & Theorell, 1990). Contemporary studies similarly demonstrate that high job demands may increase employees' levels of burnout and work-family conflict, whereas job control dimensions such as skill utilization and decision latitude are generally associated with higher levels of vigor, dedication, and work-related motivation (Lesener et al., 2019).

Particularly in sectors such as the energy industry, where intensive work pace, high safety risks, and shift-based systems are common, employees may be exposed to higher levels of job demands. Therefore, employees' perceptions of control over work processes and the organizational resources available to them are considered critically important in terms of psychological resilience.

### **2.3.1. Workload**

Workload refers to the intensity of tasks and time pressure that employees are required to manage within a specific period. High workload may trigger stress and burnout processes by depleting employees' physical, cognitive, and emotional resources (Bakker & Demerouti, 2017). Particularly among employees working in energy companies, long working hours, operational pressures, and shift-based working systems may lead employees to perceive high levels of workload.

The literature indicates that high workload is positively associated with job stress, burnout, and work-family conflict. In addition, high workload may be associated with lower levels of vigor, dedication, energy, and work-related motivation (Mazzetti et al., 2023). Accordingly, high workload is expected to be associated with lower levels of vigor and dedication.

### **2.3.2. Skill Utilization**

Skill utilization refers to employees' ability to use their knowledge, skills, and competencies within work processes. Employees' effective use of their competencies may contribute to perceiving their jobs as more meaningful and participating more actively in organizational processes.

The literature suggests that skill utilization is positively associated with employee motivation, job satisfaction, vigor, and dedication (Bakker & Albrecht, 2018). Providing employees with learning and development opportunities is reported to enhance their perceptions of psychological empowerment and contribute to the development of positive occupational attitudes. In particular, employees are likely to report higher levels of vigor and dedication in work environments where they are able to utilize their competencies effectively (Schaufeli, 2021). Ac-

cordingly, increases in employees' levels of skill utilization may be positively associated with their levels of vigor and dedication.

### 2.3.3. Decision Latitude

Decision latitude refers to the level of autonomy and control employees possess over work processes. Employees' participation in decision-making mechanisms related to work processes, their ability to have a voice in work methods, and their control over how tasks are performed are considered important organizational resources from a psychological perspective.

Low levels of decision latitude may increase employees' stress, burnout, and psychological strain levels. In contrast, high decision latitude is reported to be positively associated with employees' job satisfaction, motivation, vigor, and dedication (Mazzetti et al., 2023). Contemporary studies demonstrate that employees' experience of autonomy within work processes supports their psychological well-being and may increase their motivation toward work (Knight et al., 2017).

Particularly in high-risk sectors, employees' perceptions of control over work processes are considered important for psychological resilience. In this regard, higher levels of decision latitude may be associated with higher levels of work-related motivation, vigor, and dedication. Accordingly, decision latitude is expected to be positively associated with vigor and dedication.

## 3. Method

### 3.1. Purpose of the Study

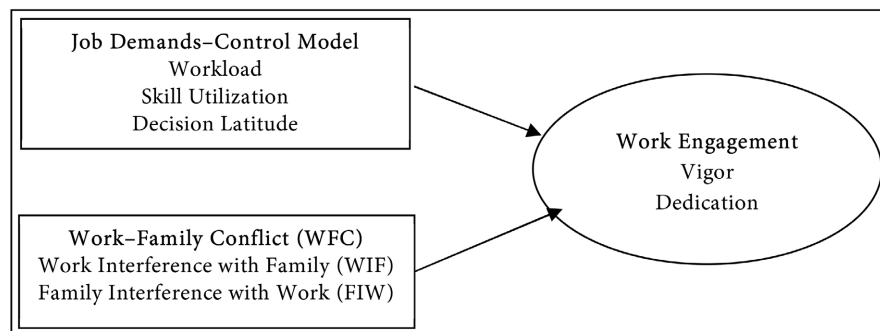
The primary aim of this study is to determine the extent to which the work engagement dimensions examined in this study, namely vigor and dedication, are predicted by work-family conflict and the subdimensions evaluated within Karasek's Job Demands-Control Model. In the present study, the relationships between work-family conflict, the subdimensions of Karasek's Job Demands-Control Model, and work engagement variables were first examined. Subsequently, in line with the proposed research model, the effects of these variables on vigor and dedication were evaluated. In this context, the study aims to examine the relationships between work-related stress, role conflicts, and employees' levels of vigor and dedication.

### 3.2. Research Model and Hypotheses

The research model was developed based on organizational behavior theories explaining the effects of psychosocial risk factors encountered in working life on employees' attitudes and behaviors, together with the subdimensions evaluated within Karasek's Job Demands-Control Model. In this framework, it was assumed that work-family conflict and the subdimensions included in Karasek's model may be significantly associated with vigor and dedication. In particular, it is considered that role conflicts experienced between employees' work and family lives, as well as their perceptions of work-related stress, may affect their work-related psychological investment in different ways.



In the study, the relationships among work-to-family conflict, family-to-work conflict, workload, skill utilization, decision latitude, vigor, and dedication were initially examined using correlation analyses. Subsequently, multiple regression analyses were conducted to evaluate the extent to which work-family conflict dimensions and Karasek-based job characteristics predicted vigor and dedication. Accordingly, the research hypotheses developed for the study are presented below in **Figure 1**:



**Figure 1.** Conceptual model of the study.

**H1:** Work-to-family conflict will be negatively associated with vigor, whereas decision latitude and skill utilization will be positively associated with vigor.

**H2:** Work-to-family conflict will be negatively associated with dedication, whereas decision latitude and skill utilization will be positively associated with dedication.

The hypotheses developed in this study aim to explain how work-to-family conflict, family-to-work conflict, workload, skill utilization, and decision latitude are associated with vigor and dedication. The relevant literature indicates that work-family conflict may negatively affect employees' psychological attachment to their work, whereas the subdimensions evaluated within Karasek's Job Demands-Control Model may demonstrate complex and multidimensional relationships with work engagement. In this context, the present study addresses the effects of work-family conflict and Karasek-based job characteristics, including workload, decision latitude, and skill utilization, on the work engagement dimensions examined in this study (vigor and dedication) within the framework of the theoretical background, and aims to empirically test the relationships among these variables.

### 3.3. Population and Sample of the Study

The population of the study consisted of employees working in a large energy production company located in Zonguldak, Türkiye. A non-probability convenience sampling method was used to recruit participants. Data were collected through a voluntary and anonymous survey administered to employees working in different operational units of the company.

A total of 650 questionnaires were distributed to eligible employees. Participation was entirely voluntary, and no incentives were provided. Of the distributed



questionnaires, 579 were returned with sufficient completeness for statistical analysis, resulting in a response rate of 89.1%. Seventy-one questionnaires were either not returned or contained substantial missing data and were therefore excluded from the study.

The final sample consisted of 579 employees. The inclusion criterion was active employment within the company at the time of data collection and voluntary agreement to participate in the study. All participants were informed about the purpose of the research and assured that their responses would remain confidential and would be used solely for scientific purposes.

The participants differed in terms of various demographic characteristics, including gender, age, marital status, educational level, perceived economic status, occupational position, length of employment within the organization, daily working hours, shift work status, night work status, managerial role, presence of chronic illness, and history of occupational accidents.

### 3.4. Data Collection Technique and Scales

The data used in the study were collected through a face-to-face survey method. A structured questionnaire consisting of four sections was used as the data collection instrument. In addition to questions aimed at determining the demographic and occupational characteristics of the participants, the questionnaire included the Karasek-based job demand-control scale, the work engagement scale, and the work-family conflict scale. The scale items were arranged using a 5-point Likert-type format, and participants were asked to evaluate each statement on a scale ranging from “1 = Strongly Disagree” to “5 = Strongly Agree”.

In order to determine employees' perceptions of job control, a scale developed within the framework of Karasek's Job Demands-Control Model and based on the Job Content Questionnaire (JCQ) was used in the study. The scale consists of three subdimensions: “Workload”, “Skill Utilization”, and “Decision Latitude”. The theoretical basis of the scale relies on the Job Demands-Control Model developed by Karasek. According to this model, the job demands employees are exposed to and their level of control over work processes are among the main determinants of psychosocial experiences in working life. According to Karasek's Job Demands-Control Model, the “Workload” dimension represents job demands, whereas the “Skill Utilization” and “Decision Latitude” subdimensions represent employees' levels of control and autonomy over work processes. In the scale, the workload dimension evaluates employees' perceptions regarding work intensity and time pressure; the skill utilization dimension assesses the extent to which employees are able to use their knowledge, skills, and competencies in work processes; and the decision latitude dimension evaluates employees' perceptions of autonomy and control over work processes. Higher scores obtained from the scale indicate higher perceptions regarding the relevant dimension.

In order to determine employees' levels of work engagement, the Utrecht Work Engagement Scale (UWES) was used in the study. The scale was developed by

Schaufeli and Bakker and originally consists of three dimensions: vigor, dedication, and absorption. In the present study, work engagement was operationalized using the vigor and dedication dimensions only.

The absorption dimension was excluded from the analyses because the present study primarily focused on the motivational and affective aspects of work engagement that are more directly associated with psychosocial occupational stressors and organizational resources in high-risk work environments. Previous studies have suggested that vigor and dedication represent the core motivational dimensions of work engagement, whereas absorption may reflect a more task-focused cognitive state rather than a direct indicator of motivational well-being (Schaufeli et al., 2002; Sonnentag, 2003). Furthermore, some scholars have argued that absorption may conceptually overlap with intensive task concentration or workaholic tendencies under certain occupational conditions, making vigor and dedication more appropriate indicators of positive motivational engagement in demanding work settings (Bakker & Oerlemans, 2011).

The vigor dimension refers to employees' levels of energy, vitality, and motivation toward their work, whereas the dedication dimension reflects employees' motivational investment resulting from perceiving their work as meaningful, important, and valuable. Accordingly, all analyses and interpretations presented in this study are based exclusively on the vigor and dedication dimensions of work engagement.

In order to determine employees' levels of work-family conflict, the work-family conflict scale was used. The scale was developed to evaluate the role conflicts experienced by employees between their work and family roles and consists of two subdimensions: "Work-to-Family Conflict" and "Family-to-Work Conflict". The work-to-family conflict dimension measures the negative effects of work-related demands on family life, whereas the family-to-work conflict dimension measures the effects of family-related responsibilities and pressures on work life. Higher scores obtained from the scale indicate that employees perceive work-family conflict more intensely.

### 3.5. Analysis of Research Data

The normality assumptions regarding the dimension and subdimensions scores of the scales used in the study were examined through the Kolmogorov-Smirnov test. Cases with substantial missing responses were excluded prior to analysis. Missing values in the remaining dataset were minimal and handled through list-wise deletion. The analysis results suggested that some variables partially deviated from normal distribution. However, skewness and kurtosis values were within acceptable limits, no substantial outliers were detected, and linear relationships among the variables were observed. Therefore, the data were considered suitable for parametric analyses. In addition, due to the large sample size, parametric tests were assumed to be robust against limited violations of the normality assumption.

Cronbach's Alpha coefficients were used to determine the internal consistency

levels of the scales, and exploratory factor analysis was conducted to examine construct validity. Pearson correlation analysis was used to determine the relationships among the variables. Multiple linear regression analyses were performed to examine the relationships between work-to-family conflict, family-to-work conflict, workload, skill utilization, decision latitude, and the work engagement dimensions examined in this study (vigor and dedication). Separate regression models were estimated for vigor and dedication. Standard multiple regression (Enter method) was employed in the analyses. In the evaluation of the regression models, the explanatory power ( $R^2$ ), model significance (F test), and standardized regression coefficients ( $\beta$ ) were taken into consideration.

Prior to the regression analyses, the assumptions of multicollinearity, normality of error terms, and autocorrelation were examined. Tolerance and Variance Inflation Factor (VIF) values were found to be within acceptable limits, indicating that there was no critical multicollinearity problem among the variables. In addition, the error terms were found to display an approximately normal distribution, and the Durbin-Watson coefficient was determined to be within the acceptable range in terms of autocorrelation. Since all study variables were collected using self-report measures, the possibility of common method bias was considered. Harman's single-factor test was conducted, and the results suggested that no single factor accounted for the majority of the total variance, suggesting that common method bias was not a serious concern in the present study.

### 3.6. Ethical Considerations

Ethical approval for the study was obtained from the Ethics Committee of Zonguldak Bülent Ecevit University prior to the data collection process. Participation in the study was voluntary, informed consent was obtained from all participants, and confidentiality and anonymity of participant responses were assured throughout the research process. The study was conducted in accordance with established ethical standards for research involving human participants.

## 4. Findings

### 4.1. Demographic Data (Table 1)

When the age distribution of the participants was examined, it was determined that 41.5% of the sample were aged 35 years and below, 49.2% were between the ages of 36 and 45, and 9.3% were aged 46 years and above. The majority of the participants were male (95.0%), whereas females represented 5.0% of the sample. In terms of educational background, 12.1% of the participants had a middle school education or below, 45.1% had completed high school education, and 42.8% had an associate degree or higher level of education.

Regarding occupational status, 21.2% of the employees were classified as white-collar workers, while 78.8% were blue-collar workers. It was also found that 73.9% of the participants were married and 26.1% were single. Regarding perceived economic status, half of the participants (50.1%) evaluated their economic condition

as moderate, whereas 37.0% perceived it as poor, 8.3% as very poor, and 4.7% as good. In addition, 9.7% of the sample reported having a chronic illness, while 90.3% stated that they did not have any chronic illness.

**Table 1.** Demographic findings.

| Variable Category                         |                            | n   | %     |
|-------------------------------------------|----------------------------|-----|-------|
| Age                                       | 35 and below               | 240 | 41.5% |
|                                           | 36 - 45                    | 285 | 49.2% |
|                                           | 46 and above               | 54  | 9.3%  |
| Gender                                    | Male                       | 550 | 95.0% |
|                                           | Female                     | 29  | 5.0%  |
| Educational Level                         | Middle School and Below    | 70  | 12.1% |
|                                           | High School                | 261 | 45.1% |
|                                           | Associate Degree and Above | 248 | 42.8% |
| Occupational Class                        | White-Collar               | 123 | 21.2% |
|                                           | Blue-Collar                | 456 | 78.8% |
| Marital Status                            | Married                    | 428 | 73.9% |
|                                           | Single                     | 151 | 26.1% |
| Perceived Economic Status                 | Very Poor                  | 48  | 8.3%  |
|                                           | Poor                       | 214 | 37.0% |
|                                           | Moderate                   | 290 | 50.1% |
|                                           | Good                       | 27  | 4.7%  |
| Chronic Illness                           | Yes                        | 56  | 9.7%  |
|                                           | No                         | 523 | 90.3% |
| Length of Employment at Current Workplace | Less than 1 year           | 41  | 7.1%  |
|                                           | 1 - 5 years                | 153 | 26.4% |
|                                           | 5 - 10 years               | 207 | 35.8% |
|                                           | 10 years and above         | 178 | 30.7% |
| Daily Working Hours                       | 8 hours and below          | 446 | 77.0% |
|                                           | 9 hours                    | 92  | 15.9% |
|                                           | More than 10 hours         | 41  | 7.1%  |
| Shift Work                                | Yes                        | 377 | 65.1% |
|                                           | No                         | 202 | 34.9% |
| Night Work                                | Yes                        | 409 | 70.6% |
|                                           | No                         | 170 | 29.4% |
| Managerial Role                           | Yes                        | 139 | 24.0% |
|                                           | No                         | 440 | 76.0% |
| Occupational Accident History             | Yes                        | 90  | 15.5% |
|                                           | No                         | 489 | 84.5% |

An examination of the occupational characteristics of the participants showed that 7.1% had been employed at their current workplace for less than one year, 26.4% for 1 - 5 years, 35.8% for 5 - 10 years, and 30.7% for 10 years or more. In terms of daily working hours, 77.0% of the employees worked 8 hours or less per day, 15.9% worked 9 hours per day, and 7.1% worked 10 hours or more.

Findings related to working arrangements showed that 65.1% of the participants worked in a shift system and 70.6% were involved in night work. Furthermore, 24.0% of the employees held managerial positions, whereas 76.0% did not have any managerial responsibilities. From an occupational health and safety perspective, 15.5% of the participants reported having previously experienced an occupational accident, while 84.5% stated that they had not experienced any occupational accident.

#### 4.2. Descriptive Statistics (Table 2)

Cronbach's Alpha coefficients, explained variance ratios, and Kaiser-Meyer-Olkin (KMO) sample adequacy values were examined in order to evaluate the reliability and construct validity of the scales used in the study. The findings suggested that all scales employed in the research showed adequate construct validity and high levels of internal consistency.

**Table 2.** Reliability analysis results of the scales.

| Scale                                                               | Explained Variance | Reliability | KMO  | Mean $\pm$ SD   |
|---------------------------------------------------------------------|--------------------|-------------|------|-----------------|
| <b>Work-Family Conflict Scale</b>                                   | 69%                | 0.92        | 0.90 | 3.14 $\pm$ 0.54 |
| <b>Work-to-Family Conflict Subscale</b>                             | 34%                | 0.88        |      | 2.88 $\pm$ 0.96 |
| <b>Family-to-Work Conflict Subscale</b>                             | 35%                | 0.87        |      | 3.39 $\pm$ 0.46 |
| <b>Karasek's Job Content Questionnaire/Job Demand-Control scale</b> |                    |             | 0.92 |                 |
| <b>Workload Subscale</b>                                            | 26%                | 0.84        |      | 3.19 $\pm$ 0.67 |
| <b>Skill Utilization Subscale</b>                                   | 24%                | 0.85        |      | 3.61 $\pm$ 0.53 |
| <b>Decision Latitude Subscale</b>                                   | 22%                | 0.82        |      | 3.66 $\pm$ 0.63 |
| <b>Work Engagement Scale</b>                                        | 65%                | 0.89        | 0.88 | 3.67 $\pm$ 0.74 |
| <b>Vigor Subscale</b>                                               | 31%                | 0.85        |      | 4.05 $\pm$ 0.73 |
| <b>Dedication Subscale</b>                                          | 34%                | 0.85        |      | 3.24 $\pm$ 0.81 |

The Cronbach's Alpha coefficient of the work-family conflict scale was found to be 0.92, indicating a very high level of reliability. According to the factor analysis results, the scale exhibited a two-dimensional structure consisting of "Work-to-Family Conflict" and "Family-to-Work Conflict". The total explained variance ratio of the two factors was 69%, demonstrating satisfactory construct validity. In

addition, the KMO sample adequacy coefficient was calculated as 0.90, indicating that the dataset was highly suitable for factor analysis. Examination of the subdimensions revealed that the Cronbach's Alpha coefficient of the "Work-to-Family Conflict" dimension was 0.88 with an explained variance ratio of 34%, whereas the "Family-to-Work Conflict" dimension had a reliability coefficient of 0.87 and an explained variance ratio of 35%. The overall mean score of participants' work-family conflict level was determined as  $3.14 \pm 0.54$ , suggesting that work-family conflict was perceived at a moderate level. Regarding the subdimension means, the "Work-to-Family Conflict" dimension had a mean score of  $2.88 \pm 0.96$ , whereas the "Family-to-Work Conflict" dimension had a mean score of  $3.39 \pm 0.46$ . This finding indicates that the influence of family life on work processes was perceived to be higher than the influence of work life on family life.

The factor analysis results supported a three-dimensional structure consisting of Workload, Skill Utilization, and Decision Latitude. Reliability coefficients for these dimensions ranged from 0.82 to 0.85, indicating satisfactory internal consistency. According to the factor analysis results, the scale consisted of a three-dimensional structure including "Workload", "Skill Utilization", and "Decision Latitude". The total explained variance ratio of the three factors was 72%, demonstrating strong structural validity of the scale. Furthermore, the KMO coefficient was determined as 0.92, indicating a highly adequate sample size for factor analysis. Examination of the subdimensions showed that the "Workload" dimension had a Cronbach's Alpha coefficient of 0.84 and an explained variance ratio of 26%; the "Skill Utilization" dimension had a reliability coefficient of 0.85 and an explained variance ratio of 24%; and the "Decision Latitude" dimension had a reliability coefficient of 0.82 and an explained variance ratio of 22%. The mean scores were  $3.19 \pm 0.67$  for Workload,  $3.61 \pm 0.53$  for Skill Utilization, and  $3.66 \pm 0.63$  for Decision Latitude.

The reliability and construct validity analyses of the work engagement scale suggested that the scale possessed strong psychometric properties. The Cronbach's Alpha coefficient of the scale was 0.89, demonstrating a high level of reliability. Factor analysis results revealed that the scale exhibited a two-dimensional structure consisting of "Vigor" and "Dedication". The total explained variance ratio of the two subdimensions was 65%, indicating that the scale had an adequate level of structural explanatory power. In addition, the KMO coefficient was found to be 0.88, suggesting that the dataset was highly appropriate for factor analysis.

At the subdimension level, the "Vigor" dimension had a Cronbach's Alpha coefficient of 0.85 and an explained variance ratio of 31%. Similarly, the "Dedication" dimension had a reliability coefficient of 0.85 and an explained variance ratio of 34%. These findings demonstrate that both subdimensions of the scale possessed adequate internal consistency.

The overall mean score of participants' work engagement level was determined as  $3.67 \pm 0.74$ , indicating that employees' work engagement levels were generally moderate to high. Examination of the subdimension means revealed that the

“Vigor” dimension was perceived at a high level, with a mean score of  $4.05 \pm 0.73$ . In contrast, the “Dedication” dimension had a relatively lower mean score of  $3.24 \pm 0.81$ . These findings suggest that employees showed high levels of energy, motivation, and willingness toward their work; however, their emotional and psychological dedication to work remained comparatively more limited (Table 3).

**Table 3.** Correlation analysis results between the work engagement scale, the work-family conflict scale, and the Karasek’s job content questionnaire (JCQ).

| Variables                        |          | Work Engagement Scale | Vigor Subscale | Dedication Subscale |
|----------------------------------|----------|-----------------------|----------------|---------------------|
| Work-Family Conflict Scale       | <i>r</i> | −0.23*                | −0.27*         | −0.23*              |
|                                  | <i>p</i> | <0.01                 | <0.01          | <0.01               |
| Work-to-Family Conflict Subscale | <i>r</i> | −0.37*                | −0.22*         | −0.20*              |
|                                  | <i>p</i> | <0.01                 | <0.01          | <0.01               |
| Family-to-Work Conflict Subscale | <i>r</i> | 0.24*                 | 0.35*          | 0.22*               |
|                                  | <i>p</i> | <0.01                 | <0.01          | <0.01               |
| Workload Subscale                | <i>r</i> | 0.06                  | 0.08           | 0.11*               |
|                                  | <i>p</i> | 0.15                  | 0.05           | 0.01                |
| Skill Utilization Subscale       | <i>r</i> | 0.19*                 | 0.36*          | 0.19*               |
|                                  | <i>p</i> | <0.01                 | <0.01          | <0.01               |
| Decision Latitude Subscale       | <i>r</i> | 0.89*                 | 0.85*          | 0.79*               |
|                                  | <i>p</i> | <0.01                 | <0.01          | <0.01               |

\*Correlation is significant at the 0.01 level.

The results of the Pearson correlation analysis revealed a negative and weak but statistically significant relationship between the work-family conflict scale and the work engagement scale ( $r = -0.23$ ,  $p < 0.01$ ). Similarly, work-family conflict was found to have significant negative relationships with the subdimensions of work engagement, namely Vigor ( $r = -0.27$ ,  $p < 0.01$ ) and Dedication ( $r = -0.23$ ,  $p < 0.01$ ). These findings indicate that as employees’ levels of work-family conflict increase, their levels of work engagement tend to decrease.

The work-to-family conflict subdimension was found to have a negative and significant relationship with Work Engagement ( $r = -0.37$ ,  $p < 0.01$ ). Likewise, this dimension showed negative relationships with Vigor ( $r = -0.22$ ,  $p < 0.01$ ) and Dedication ( $r = -0.20$ ,  $p < 0.01$ ). These findings suggest that the negative effects of work-related roles and responsibilities on family life may weaken employees’ motivational and psychological attachment to their work.

The positive relationship observed between the family-to-work conflict dimension and work engagement represents a noteworthy finding. This dimension showed positive and significant relationships with Work Engagement ( $r = 0.24$ ,  $p < 0.01$ ), Vigor ( $r = 0.35$ ,  $p < 0.01$ ), and Dedication ( $r = 0.22$ ,  $p < 0.01$ ). Although



the positive relationship between family-to-work conflict and work engagement differs from the predominantly negative associations reported in previous literature, this finding may reflect culture-specific interpretations of family responsibilities within collectivist social structures. Nevertheless, the finding should be interpreted cautiously because contextual and measurement-related factors may also have influenced the observed relationship.

The workload subdimension was not significantly associated with Work Engagement ( $r = 0.06$ ,  $p = 0.15$ ) or Vigor ( $r = 0.08$ ,  $p = 0.05$ ). However, a low-level positive and significant relationship was found between workload and Dedication ( $r = 0.11$ ,  $p < 0.01$ ). This finding may reflect employees' normalization of heavy workload as an inherent characteristic of the sector.

The skill utilization subdimension showed a positive and weak but significant relationship with Work Engagement ( $r = 0.19$ ,  $p < 0.01$ ). In addition, positive relationships were identified with Vigor ( $r = 0.36$ ,  $p < 0.01$ ) and Dedication ( $r = 0.19$ ,  $p < 0.01$ ). These results indicate that employees' ability to effectively utilize their knowledge, skills, and competencies in work processes may enhance their levels of work engagement.

Decision latitude showed a strong positive relationship with work engagement ( $r = 0.89$ ,  $p < 0.01$ ), as well as with vigor and dedication. Although the correlation coefficients between decision latitude and work engagement were relatively high, VIF and tolerance diagnostics remained within acceptable thresholds, suggesting that multicollinearity was not severe. Nevertheless, the possibility of partial conceptual overlap between autonomy-related job resources and engagement perceptions should be considered when interpreting the findings. In addition, because all variables were measured using self-report instruments, the potential influence of common method variance cannot be entirely ruled out despite the results of Harman's single-factor test (Table 4).

**Table 4.** Multiple linear regression analyses predicting vigor and dedication from work-family conflict and job characteristics.

| Dependent Variable | Decision Latitude Sub dimension ( $\beta$ ) | Skill Utilization Sub dimension ( $\beta$ ) | Work-to-Family Conflict Sub dimension ( $\beta$ ) | F Model        | R <sup>2</sup> |
|--------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------------|----------------|----------------|
| Vigor              | 0.84                                        | 0.27                                        | -0.25                                             | 125.33         | 0.75           |
| <i>p</i>           | <0.01                                       | <0.01                                       | <0.01                                             | ( $p < 0.01$ ) |                |
| Dedication         | 0.73                                        | 0.21                                        | -0.20                                             | 112.35         | 0.71           |
| <i>p</i>           | <0.01                                       | <0.01                                       | <0.01                                             | ( $p < 0.01$ ) |                |

Additional regression analyses were performed to examine the predictive effects of work-to-family conflict, family-to-work conflict, workload, skill utilization, and decision latitude on vigor and dedication.

The regression model for the Vigor subdimension was found to be statistically significant ( $F = 125.33$ ,  $p < 0.01$ ). The results suggested that decision latitude, skill

utilization, and the work-to-family conflict dimension were significant predictors of vigor levels. The explanatory power of the model was found to be high, with the independent variables explaining 75% of the total variance in vigor levels ( $R^2 = 0.75$ ). In contrast, the workload and family-to-work conflict dimensions did not make a statistically significant contribution to the model ( $p > 0.05$ ). This finding suggests that employees' motivational attachment to their work may be associated more strongly with control over work processes, autonomy, and the ability to utilize their skills than with workload intensity. One possible explanation for the non-significant effect of workload is that employees working in high-risk industrial environments may perceive heavy workload as a normative and expected aspect of the occupational context due to sector-specific working conditions and safety-oriented organizational cultures. Accordingly, workload intensity may not always be directly interpreted as a motivationally detrimental factor within such occupational environments. Furthermore, the negative effect of the work-to-family conflict dimension on vigor indicates that work-related roles and responsibilities may weaken employees' energy, motivation, and willingness to engage in their work.

The regression model for the Dedication subdimension was also found to be statistically significant ( $F = 112.35$ ,  $p < 0.01$ ). The model results showed that decision latitude, skill utilization, and the work-to-family conflict dimension had significant predictive effects on dedication levels. The explanatory power of the model was high, with the independent variables accounting for 71% of the total variance in dedication levels ( $R^2 = 0.71$ ). However, the workload and family-to-work conflict dimensions did not contribute significantly to the model ( $p > 0.05$ ). This finding suggests that employees' psychological dedication to their work is more closely associated with participation in work processes, freedom in decision-making, and the ability to utilize their skills, rather than workload intensity.

Examination of the regression coefficients revealed that the strongest effect on dedication levels belonged to the decision latitude variable ( $\beta = 0.73$ ,  $p < 0.01$ ). While the skill utilization dimension had a positive and significant effect on dedication ( $\beta = 0.21$ ,  $p < 0.01$ ), the work-to-family conflict dimension showed a negative and significant effect ( $\beta = -0.20$ ,  $p < 0.01$ ). These findings indicate that increased perceptions of control and autonomy over work processes strengthen employees' cognitive and emotional attachment to their work. Conversely, as the negative effects of work life on family life increase, employees' levels of psychological dedication to their work tend to decrease.

Findings regarding H1 showed that decision latitude and skill utilization positively predicted vigor, whereas work-to-family conflict negatively predicted vigor. In contrast, workload and family-to-work conflict were not significant predictors. Therefore, H1 was partially supported.

Findings regarding H2 revealed that decision latitude and skill utilization positively predicted dedication, whereas work-to-family conflict negatively predicted dedication. However, workload and family-to-work conflict did not demonstrate significant effects. Therefore, H2 was partially supported.

One noteworthy finding was that family-to-work conflict demonstrated positive bivariate associations with vigor and dedication in the correlation analyses. Although this finding differs from the dominant pattern reported in previous literature, it may reflect culture-specific and sector-specific occupational dynamics. Another possible explanation may involve suppressor effects within the regression models, as family-to-work conflict showed positive bivariate correlations but did not retain significant effects in multivariate analyses. Moreover, employees who are highly engaged in their work may simultaneously experience stronger role salience across both work and family domains, thereby reporting higher family-to-work interference perceptions. In this respect, employees with higher levels of psychological investment in work may also perceive family-related responsibilities more intensely because of their increased sensitivity toward balancing multiple role expectations. Nevertheless, the finding should be interpreted cautiously and verified through future longitudinal and cross-cultural research.

Based on the findings obtained, it is recommended that organizations develop management practices that support employee autonomy, increase employee participation in decision-making processes, and promote job designs encouraging skill utilization. In addition, the development of organizational practices that support work-family balance may be considered an important organizational resource for enhancing engagement levels.

## 5. Conclusion

This study examined the extent to which the work engagement dimensions examined in this study, namely vigor and dedication, were associated with work-family conflict, workload, skill utilization, and decision latitude among employees working in the energy sector. Overall, the findings indicate that employees' levels of vigor and dedication were associated not only with work-related stressors but also with organizational resources such as autonomy, participation in decision-making processes, and opportunities to utilize their skills and competencies effectively. Particularly in sectors such as the energy industry, where high-risk, heavy workload, and shift-based working conditions are prevalent, employees' psychosocial experiences appear to be closely related to these motivational dimensions of work engagement.

The findings revealed that work-family conflict was negatively associated with vigor and dedication. This result is consistent with previous studies demonstrating that work-family conflict is associated with lower levels of employees' psychological well-being and work-related motivation (Allen et al., 2000; French et al., 2018). In particular, the spillover of role pressures originating from work into family life appears to be associated with reduced energy, motivation, and psychological investment in work. According to Conservation of Resources theory, the depletion of individuals' psychological and physical resources may contribute to stress and motivational loss (Hobfoll, 1989). In this context, work-family conflict may be interpreted as a factor associated with lower levels of vigor and dedication.

One noteworthy finding was that family-to-work conflict showed positive relationships with vigor and dedication in certain analyses. Although this result differs from the predominantly negative associations reported in previous literature, it may reflect culture-specific interpretations of family responsibilities within collectivist social contexts and sector-specific occupational norms. Another possible explanation may involve suppressor effects within the regression models, as family-to-work conflict showed positive bivariate correlations but did not retain significant effects in multivariate analyses. Therefore, this finding should be interpreted as exploratory rather than conclusive.

From the perspective of Karasek's Job Demand-Control Model, the findings suggest that decision latitude and skill utilization function as important organizational resources associated with vigor and dedication. In particular, decision latitude appeared to be the strongest predictor of both vigor and dedication, indicating that employees' perceived autonomy and participation in decision-making processes are closely related to their motivational attachment to work. Similarly, opportunities to effectively utilize professional skills and competencies may enhance employees' sense of meaning, enthusiasm, and involvement in organizational processes. These findings are consistent with the Job Demands-Resources framework, which emphasizes the motivational role of organizational resources in fostering positive work-related states (Bakker & Demerouti, 2017).

In contrast, workload did not demonstrate a significant relationship with vigor or dedication, suggesting that intensive workload conditions may be perceived as a normalized aspect of high-risk occupational environments. In such settings, workload may be viewed as an expected component of occupational identity, thereby reducing its direct psychological association with motivational outcomes. In addition, heavy workload may sometimes be interpreted by employees as an indicator of responsibility, competence, or organizational importance within demanding occupational cultures. This finding may indicate that employees working in high-risk industrial environments normalize heavy workload as an inherent aspect of their occupational context, thereby reducing its observable relationship with vigor and dedication.

From a practical perspective, the findings suggest that organizations should develop management practices that support employee autonomy in order to strengthen vigor and dedication among employees. Participation in decision-making processes, perceived control over work activities, and opportunities to use skills effectively may contribute to higher levels of motivation and psychological involvement in work. Furthermore, organizations are advised to implement work-family balance practices, revise shift scheduling systems according to employee needs, and develop psychosocial support programs. Strengthening organizational resources and employee autonomy may contribute not only to higher levels of vigor and dedication but also to occupational safety and sustainable workforce performance in high-risk industries.

Several limitations of the study should also be acknowledged. First, the research

was conducted only among employees working in the energy sector in Zonguldak, Türkiye. Since convenience sampling was used, the findings may not fully represent all employees working in the energy sector. Therefore, caution is required when generalizing the results to different occupational groups and organizational contexts. Second, the cross-sectional design of the study limits the ability to establish definitive causal relationships among the variables. In addition, the relatively high correlation coefficients observed between decision latitude and both vigor and dedication may indicate partial conceptual overlap between autonomy-related organizational resources and motivational perceptions. Although multicollinearity diagnostics did not indicate a critical statistical problem, this finding may also suggest that employees' perceptions of autonomy and control constitute central motivational resources in high-risk occupational settings. Although Harman's single-factor test did not indicate a severe common method bias problem, the findings should be interpreted with caution because all variables were collected through self-report measures. Future studies are recommended to employ additional procedural and statistical remedies, including multi-source and longitudinal research designs, in order to minimize potential common method variance more effectively and provide clearer conceptual differentiation between these constructs.

Future studies may also benefit from confirmatory factor analysis to further examine the conceptual boundaries between decision latitude, vigor, and dedication. In addition, future research conducted across different sectors may incorporate additional variables such as organizational support, leadership style, psychological resilience, and other organizational resources into the research model.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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