ASSESSMENT OF PSYCHOSOCIAL RISK FACTORS AMONG AIR TRAFFIC CONTROLLERS

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ABSTRACT

ASSESSMENT OF PSYCHOSOCIAL RISK FACTORS AMONG AIR TRAFFIC CONTROLLERS

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Impeccable air traffic controlling is of vital importance for air traffic management and aviation safety. Air traffic controllers, who provide advisory services to the aircraft in airspace and on the ground, usually face high level of psychological risk factors due to essence of the work.

Although psychosocial risk factors among air traffic controllers have been investigated since air traffic control services were born by the first decade of the twentieth century, there is still need for further studies in this field, especially based on type of control service apart from physical working conditions. The main objective of this study is to assess psychosocial risk factors among air traffic controllers to determine the psychosocial work environment constituents which can be improved through administrative implementations. The research methodology followed in the study mainly consists of three phases as: scale development, implementation of the scale, and assessment of psychosocial risk factors. Initially a risk assessment scale predominantly based on the NIOSH Generic Job Stress Questionnaire is developed, then necessary data is gathered through questionnaires and finally exploratory factor analysis of the data was conducted and obtained results were interpreted. In total 230 air traffic controllers working in the Directorate of Air Traffic Control Center, Turkey

participated in the study and data analysis was conducted by using IBM SPSS Statistics 23. Research findings revealed that working conditions of air traffic controllers is a field of study which is quite open to improvement in terms of psychosocial risks. The main novelty of this research study is to make significant contribution towards improving psychosocial working conditions of area controllers through assessment of psychosocial risk factors they are exposed to. Obtained results and recommendations are expected to raise awareness in the sector and help leading new approaches to re-arranging working patterns, thus promoting occupational health and safety of air traffic controllers and aviation safety.

Keywords: Psychosocial Risk Factors, Air Traffic Controllers, Area Controllers, Occupational Health and Safety, Aviation Safety

ÖZ

HAVA TRAFİK KONTROLÖRLERİNİN PSİKOSOSYAL RİSK FAKTÖRLERİNİN DEĞERLENDİRİLMESİ

Altunok, Gizem
Yüksek Lisans, İş Sağlığı ve Güvenliği
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Hava trafiğinin etkin ve verimli bir şekilde yönetilmesi ve havacılık emniyetinin sağlanması bakımından, hava trafik kontrol hizmetinin hatasız biçimde verilmesi hayati öneme sahiptir. Hava sahasında seyreden ve yerde hareket eden uçakları yönlendiren hava trafik kontrolörleri, işlerinin doğası gereği pek çok psikososyal risk etmenine maruz kalmaktadır. Hava trafik kontrolörlerinin maruz kaldığı psikososyal risk etmenleri, hava trafik kontrol hizmetinin ortaya çıktığı yirminci yüzyılın başlarından beri araştırılmaktadır; ancak psikososyal çalışma koşullarının fiziksel koşullardan bağımsız incelendiği ve kontrol hizmetinin türüne özgü yapılacak daha fazla çalışmaya ihtiyaç vardır. Bu çalışmanın temel amacı, yönetsel uygulamalar yoluyla iyileştirilebilecek çalışma ortamı bileşenlerini belirlemek amacıyla hava trafik kontrolörlerinin maruz kaldığı psikososyal risk etmenlerini değerlendirmektir. Bu çalışmada izlenen araştırma metodolojisi; yeni ölçeğin geliştirilmesi, ölçeğin uygulanması ve psikososyal risk etmenlerinin değerlendirilmesi olmak üzere üç aşamadan oluşmaktadır. İlk aşamada ağırlıklı olarak NIOSH Genel İş Stresi Anketi'ni temel alan bir risk değerlendirme ölçeği geliştirilmiş, daha sonra ölçek uygulanarak gerekli veriler toplanmış ve son olarak verilere açımlayıcı faktör analizi uygulanarak elde edilen sonuçlar yorumlanmıştır. Araştırmaya Türkiye Hava Trafik Kontrol

Merkezi Başmüdürlüğü'nde çalışan 230 hava trafik kontrolörü katılmış ve elde edilen verilerin analizi IBM SPSS İstatistik 23 programı kullanılarak yapılmıştır. Araştırma bulguları göstermektedir ki, hava trafik kontrolörlerinin çalışma koşulları, psikososyal riskler bağlamında gelişime oldukça açık bir çalışma sahasıdır. Bu araştırmanın asıl yeniliği, maruz kaldıkları psikososyal risk etmenlerinin değerlendirilmesi yoluyla, saha kontrolörlerinin psikososyal çalışma koşullarının iyileştirilmesine önemli katkı sağlamaktır. Elde edilen sonuçların ve tavsiyelerin, sektördeki farkındalığı artırması ve çalışma düzenini yeniden düzenlemede yeni yaklaşımlara öncülük etmesi, böylelikle hava trafik kontrolörlerinin iş sağlığı ve güvenliği seviyesine ve havacılık emniyetine katkı sağlaması beklenmektedir.

Anahtar Kelimeler: Psikososyal Risk Etmenleri, Hava Trafik Kontrolörleri, Saha Kontrolörleri, İş Sağlığı ve Güvenliği, Havacılık Emniyeti

To Zofia and Leila

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CHAPTER 1

INTRODUCTION

1.1. Background

Aviation, being a crucial part of today's world, is one of the most safety-responsive industries. Therefore, aviation safety has been a real concern for all the stakeholders. The industry-wide accident rate has been split by around 8 for deadly crashes over the past 20 years and by around 3 for hull losses considering all aircraft generations. Traffic risen by over 86 percent over the same period. This demonstrates that safety investments bear fruit, safety is increased, and accidents are mainly prevented from occurring. However, if the growing rates of congestion are noted at airports and skies, the comparative stability of the sector could be regarded somewhat stressed in present times. In addition, the growth rate of the fleet is huge, with traffic doubling every fifteen years (Airbus, 2016). Figure 1.1 illustrates the annual world air traffic forecast.

Global Market Forecast (GMF) from Airbus anticipated a doubling of worldwide air traffic over the next 15 years. Such a substantial increase in the operation of the sector implies there is no space for complacency in keeping safety. To put it merely, more flights will result in more accidents unless there is sufficient effort to reduce the rate of accidents. Therefore, all aviation statistics such as pilots, engineers, cabin crew, air traffic controllers, and others need to work together to boost attempts to improve safety to reduce the frequency of accidents (Airbus, 2016).

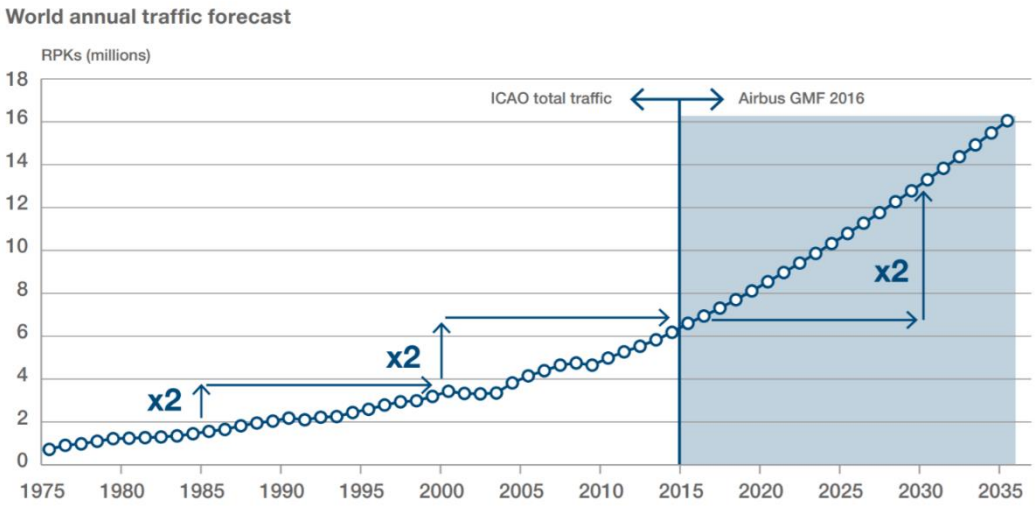

Figure 1.1. World annual traffic forecast (Airbus, 2016)

Air traffic control is one of the most important components of aviation since the job arose in 1921. According to Yazgan (2010), among all the accidents between the years 1950-2003, air traffic control (ATC)-related air traffic accidents rate is 4 percent (Figure 1.2).

When devastating results of aviation accidents are considered, it can be clearly seen that 4 percent ratio illustrated in Figure 1.2 has a substantial importance. This is the fact being the main motivation for large amount of studies conducted on enhancing working conditions of air traffic controllers.

Taking into consideration that air traffic controllers have a mental-intensive profession, the way of enhancing their working conditions requires focusing on psychosocial conditions rather than physical conditions. According to Occupational Outlook Handbook 2010 of U.S. Bureau of Labor Statistics, air traffic controllers have

the fourth most stressful job in U.S.A.; following inner-city teachers, police officers, and miners (U.S. Bureau of Labor Statistics, 2010).

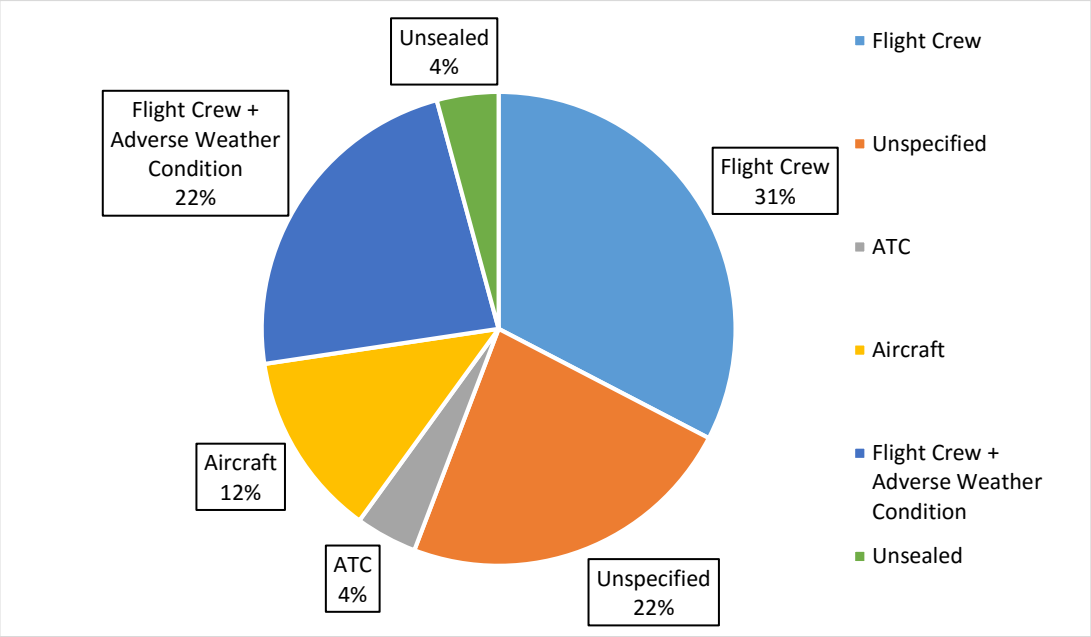

Figure 1.2. Distribution of the causes of aircraft accidents that occurred in the Turkish airspace between 1950 and 2003 (Yazgan, 2010)

As Martindale defined; air traffic control is:

> *"The job of juggling airliners and making snap decisions on which lives depend exacts a steep toll in stress-related diseases, nightmares and acute anxiety" (Martindale, 1977).*

For this reason, managing psychosocial risks they are exposed to constitutes the backbone of enhancing air traffic controllers' working conditions.

The Joint Committee of International Labour Organization (ILO) and World Health Organization (WHO) had examined the psychosocial factors in the workplace and their outcomes in their report “Psychosocial Factors at Work: Recognition and Control” which is published in 1986 by ILO (ILO, 1986). The report defined psychosocial factors in the workplace as interactivities of organizational circumstances, job requirements, workplace conditions, and employees’ specifications which might have effects on job achievements, contentment or health (ILO, 1986). It is also inferred that human factors and working environment are in a dynamic relationship. Organizational circumstances, job requirements, and workplace conditions represent occupational concerns; while workers' abilities, needs, expectations, culture, and private life represent human factors. A positive psychosocial situation at work is possible with an optimum balance between these occupational conditions and human factors, promoting work performance, job satisfaction, and also health.

Within this scope, assessment of psychosocial risk factors among air traffic controllers gets more and more important for enhancing their working conditions in terms of occupational health and safety, thus contributing to a safer aviation industry.

1.2. Statement of the Problem

Numerous researches have been conducted to investigate air traffic controllers’ working conditions, but less to focus on their psychosocial conditions. Unfortunately, number of studies specified in air traffic controllers’ duty (aerodrome, approach or area control) is quite limited. Since each branch of air traffic control has different working disciplines, it is important to work on a sample group represents the same psychosocial risk exposure.

Therefore, being the main problem of air traffic control occupation in Turkey, psychosocial risk factors among air traffic controllers has not been examined specifically and deeply by implementing a unique scale, thus sufficient contribution could not be provided to neither occupational health and safety of air traffic controllers nor aviation safety in Turkey.

1.3. Objectives and Scope of the Study

The main objective of the study is to thoroughly assess psychosocial risk factors among air traffic controllers working at Directorate of Air Traffic Control Center, Turkey (DATCCT). Motive for choosing this subject is to emphasize the importance of psychosocial risk exposure among aviation sector individuals, specifically among air traffic controllers.

The sub-objectives of the main objective are:

1. Developing a scale to assess psychosocial risk factors among air traffic controllers,
2. Making contributions to the literature in terms of providing sufficient data related to psychosocial risk factors among air traffic controllers, and
3. Examining the effects of stressors on psychosocial risk factors.

The scope of this study is air traffic controllers working at DATCCT.

1.4. Research Methodology

The research methodology essentially consists of three stages. These stages are listed as;

1. Developing a risk assessment scale predominantly based on the NIOSH Generic Job Stress questionnaire:

A literature survey is conducted to assess the questionnaires used for psychosocial risk factors measurement and finally a new scale is developed by modifying NIOSH Generic Job Stress questionnaire.

2. Implementation of the scale on the air traffic controllers working at DATCCT, Turkey and collecting data:

There are 13 demographic questions and 37 risk assessment questions in the survey. Currently, 299 air traffic controllers are employed in DATCCT. The survey is implemented to 230 air traffic controllers working at DATCCT.

3. Assessment of psychosocial risk factors among air traffic controllers working at DATCCT by using IBM SPSS Version 23:

The questions are classified by the risk factors and followingly the data derived from the questionnaire is processed. Obtained results are assessed and criticized to achieve statistical inferences which are expected to enlighten the way to risk mitigation.

1.5. Expected Contributions of the Study

This study is expected to have significant contributions towards improving psychosocial working conditions of air traffic controllers working at area control center through assessment of psychosocial risk factors they are exposed to. Obtained results and recommendations are expected to raise awareness in the sector and help leading new approaches to re-arrange working patterns.

Moreover, the study is expected to inspire distinct research on psychosocial risks among air traffic controllers working at other branches (aerodrome control and approach control) considering their conditions within the job's specific dynamics. The outcomes of this study have potential to prepare a substructure for further studies focusing on reducing psychosocial risk factors.

1.6. Outline of the Thesis

This thesis consists of five subsequent chapters. Introduction to the study is given in Chapter 1. A detailed literature survey on psychosocial risk factors and air traffic controllers is presented in Chapter 2. Then scale development steps and process is explained in Chapter 3, followed by Chapter 4 that identifies implementation of the scale among air traffic controllers and results of the questionnaire. Results are discussed in detail in Chapter 5. Finally, conclusions drawn from the results and recommendations stated in Chapter 6.

CHAPTER 2

LITERATURE REVIEW

2.1. Occupational Hazards

The workplaces where today's people spend most of their time are of great importance in terms of having occupational health and safety hazards affecting the whole life of the employees.

There are various types of workplace hazards, which can be classified under five major categories:

1. Physical hazards – Slips, trips and falls, vibration, noise, pressure extremes, magnetic fields, radiation;

2. Ergonomic hazards – Physical factors which have bad effects on the musculoskeletal system (wrong body posture, manual handling, and repetitive moves)

3. Chemical hazards – Any substance that can cause harm to the employees such as fumes, gases, vapors, liquids or dusts.

4. Biological hazards – Viruses and bacteria that can cause health effects;

5. Psychosocial hazards - Any factors that might have a negative effect on employees, psychologically, socially or both (excessive workload, lack of control, conflictions and poor communication among colleagues, poor management strategies, mobbing *etc.*).

Among these, psychosocial hazards are the most intangible group of hazards since it reflects the perceptions and experience of the employee and many factors. Some of these factors have to do with the individual employee, while others have to do with working circumstances and the job environment. Some also refer to financial and social factors that are outside the working environment but have consequences in the workplace. Over the years, research, research and examination of psychosocial variables have tried to more explicitly characterize these distinct elements as well as clarify the nature of their interactions and impacts, emphasizing health among other results.

As a conclusion, because of the reason that the psychosocial factors at work is a difficult concept to perceive and its outcomes are latent and long-term, it is the most complicated component of occupational hazards requiring further research in an unceasingly changing business world.

2.2. Psychosocial Risk Factors at Work

Psychosocial factors in the workplace are defined as interactivities of organizational circumstances, job requirements, workplace conditions and employees' specifications which might have effects on job achievements, contentment or health (ILO, 1986). Although there have been several studies conducted on psychosocial factors in the workplace up to date, most of them are found out to be referring back to this study; that is the reason why this definition is used in this research. The definition is demonstrated in Figure 2.1 below.

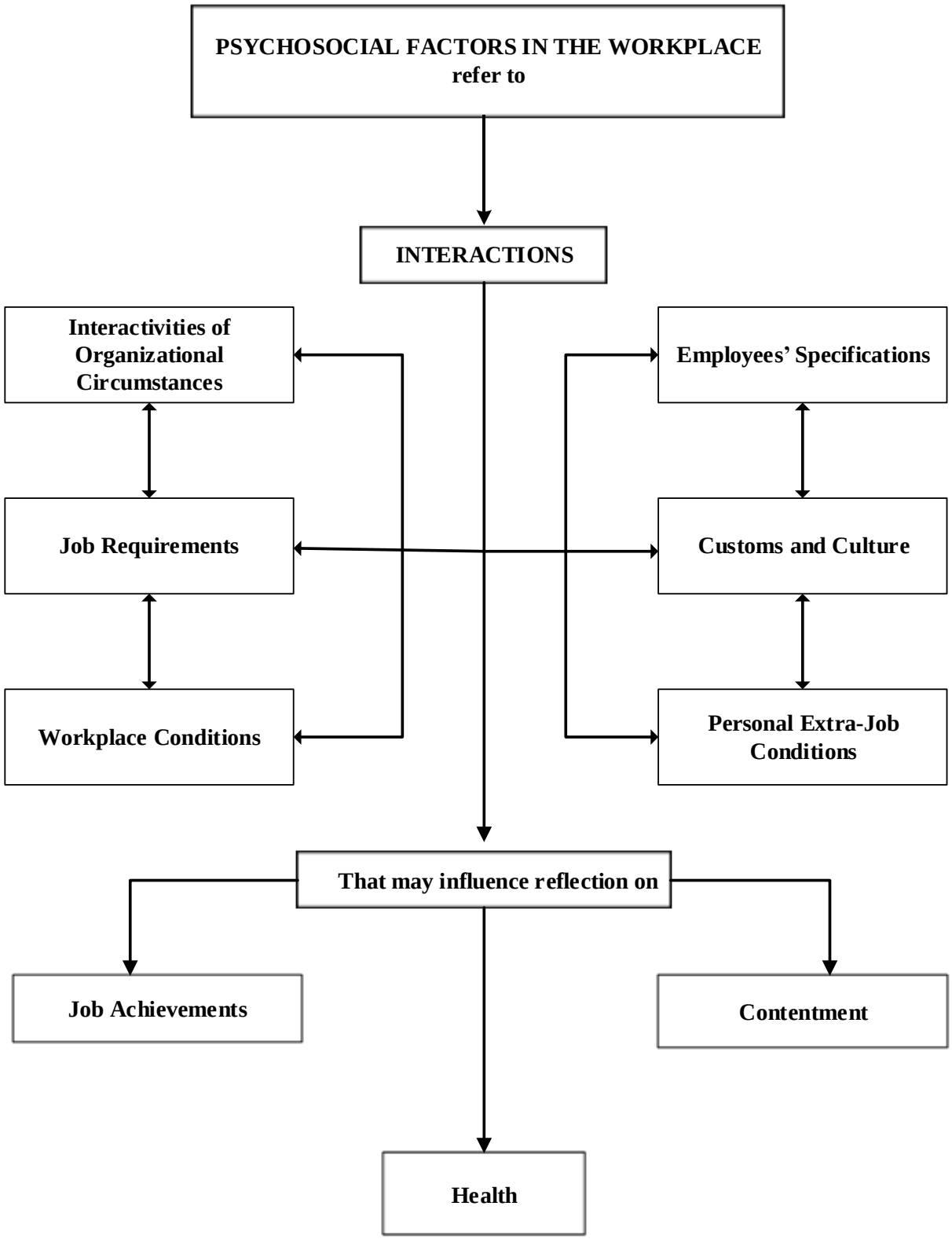

Figure 2.1. Psychosocial Factors at Work (ILO, 1986)

Human factors and the working environment which are in a dynamic relationship are shown in Figure 2.1. Work environment, job content, and organizational conditions represent occupational concerns; while workers' abilities, needs, expectations, culture, and private life represent human factors. A positive psychosocial situation at work is possible with an optimum balance between these occupational conditions and human factors, promoting work performance, job satisfaction, and also health. Psychosocial hazards are also defined as work's organizational, managerial, and social components that have the potential to cause physical or psychological harm (Cox and Griffiths, 2005). Although psychosocial factors at work vary, main classification of psychosocial hazards is shown in the Table 2.1.

Table 2.1. *Psychosocial Hazards (WHO, 2010)*

PSYCHOSOCIAL HAZARDS	
Control	Low participation in decision making, lack of control over workload, pacing, etc.
Interpersonal relationships at work	Social or physical isolation, poor relationships with superiors, interpersonal conflict, lack of social support, bullying, harassment
Job content	Lack of variety or short work cycles, fragmented or meaningless work, under use of skills, high uncertainty, continuous exposure to people through work
Role in organisation	Role ambiguity, role conflict, and responsibility for people
Workload and work pace	Work overload or under load, machine pacing, high levels of time pressure, continually subject to deadlines
Organisational culture and function	Poor communication, low levels of support for problem solving and personal development, lack of definition of, or agreement on, organisational objectives
Environment and equipment	Inadequate equipment availability, suitability or maintenance, poor environmental conditions, such as lack of space, poor lighting, excessive noise
Home-work interface	Conflicting demands of work and home, low support at home, dual career problems
Work schedule	Shift working, night shift, inflexible work schedules, unpredictable hours, long or unsociable hours
Career development	Career stagnation and uncertainty, under promotion or over promotion, poor pay, job insecurity, low social value to work

The following sections provide brief explanations for each type of psychological hazards as listed in Table 2.1.

2.2.1. Job Content

Work cycle is a sequence of activities and movements (constituting the elements of a job) which are repeated with little or no variation each time the job is performed. Lack of variety or short work cycles make it much more difficult to concentrate on the task because of monotony.

Fragmented or meaningless work refers to a situation in which the employee sees himself useless at times, since the task outcome does not play a key role in the job done, thus is not satisfying.

When the employee mismatches the job and he/she has more qualifications than job requirements, it leads under use of skills which decimates working discipline and job satisfaction. Moreover, high uncertainty causes chaos and continuous exposure to people through work causes lack of concentration and both affect work discipline negatively.

2.2.2. Workload and Work Pace

Researchers describe both work overload and work underload as prospective sources of stress. Overload is defined as having too much work to do over a given period of time, and underload is also defined as having too few tasks to do per unit time. On the other hand, overload also means work that is too difficult for an individual and underload occurs when the work does not take advantage of the skills of the individual (Rout and Rout, 2002).

Work underload was defined as a job which is done in a routine, repetitive and boring manner (Rout and Rout, 2002). Work under load may also cause adaptation problems. Work overload adversely affects mental and physical health, self-confidence and productivity (Lilly *et al.*, 2019). It may cause burnout syndrome which is a psychological stress caused by job demands exceeding employee's adaptive capacity.

Machine pacing is a concept that is frequently used in the literature meaning an activity that needs a worker to conduct a reaction or series of reactions at a specified pace other than self-decided reaction. Due to the physical and cognitive effort required to perform it, the nature of the work being paced varies. While most study on paced job focuses on assembly line assignments, there is a fresh generation of paced works that require more cognitive ability than physical capacity of the employees. Most of these works are repetitive, short cycled, and consist of exploring; raising consciousness, taking decisions, and taking activities that are contrary to assembly line duties. Thus, there is diverse varieties of paced jobs associated with increased anxiety among employees (Hurrell JJ. and Colligan, 1986).

Time pressure is a proportional shortage of time to perform a job relative to the available time, should be regarded as the significant contributor to the workload (Park *et al.*, 2018).

2.2.3. Work Schedule

Shift work includes all working schedules such as early morning, late afternoon, late night, fixed or rotating shifts. Shift work is observed to rise from 4 percent to 13

percent between the years 2000 to 2014 (Cheng and Drake, 2019). One of the most significant effect of shift work is sleep disorders. Many shift employees have difficulty adjusting to the shift schedule, resulting in sleep deprivation or excessive sleep.

Cheng and Drake (2019) also stated that psychosocial functioning is a significant but sometimes overlooked domain of shift work concept. Psychosocial working circumstances have also found to be accounting for the connection between shift work and anxiety. Another research discovered that shift employees reported feeling that they receive insufficient assistance from the executives and leader. There have also been reports, on the other side, that shift employees can create powerful friendships because of the unique difficulties they experience all together (Cheng and Drake, 2019).

Shift work also appears to have a negative impact on social engagement. While day staff spent on social participation an average of 8.25 hours per week, the average amount of shift staff was about 6.75 hours per week. When the importance of social connectivity to mental health is considered, it is also probable that social isolation and reduced social participation exacerbate shift work originated mental disorders (Cheng and Drake, 2019).

2.2.4. Control

A decision is the consequence of a decision-making method that explores and compares options in search of the best one based on the evaluation criteria used. There are many ways in which decisions can be affected. The environmental factors that have been affected by individual decision-making can be identified as job features, authority, work-life balance, career, organizational features, organizational features,

and team features. However, there are other variables that can affect decision-making, other than environmental variables. Since individuals make choices, there are also many human factors that are likely to affect decision-making, such as the experience of decision-makers, communication between decision-makers, the amount of stress on decision-makers and the cognitive style of decision-makers, emotional impact on decision-making and behavioral prejudice. Finally, the personality of the decision-maker is another significant element that affects decision-making (Mendes *et al.*, 2019).

There are many studies about the relationship between participation in decision making and job satisfaction. Participation in organizational decision making plays a significant role in employee's sense of fulfilment. The overall satisfaction with the organization is increased with employee's participation in decision making (Driscoll, 1977).

According to Muindi (2014), the level of job satisfaction is mainly affected by the level of employee involvement in decision-making. These include salary, working hours, future opportunities, work difficulty, job content, and interpersonal relationships. His study showed that job autonomy was much more important compared to monetary rewards. This gives the premise for advance enhancement in employees' participation in administrative so as to improve their levels of job satisfaction. The study confirmed that employee participation in decision making increases job satisfaction (Muindi, 2014).

Moreover, participative decision making is a quite worthy element of a good management. Appelbaum *et al.* (2013) stated that when employees trust their leaders, it motivates and promotes employee participation in decision-making that enhances

the efforts of the employees, advantages their job satisfaction, and work engagement. In turn, all these variables lead to a trustworthy connection between manager and employee. It was discovered that leadership confidence of employees is a significant determinant of their readiness to take part in decision making. In turn, insufficient involvement of employees in decision-making leads to low level of job satisfaction and dedication of employees. Lack of commitment of the employee impacts employee's tendency to quit the job (Appelbaum *et al.*, 2013).

2.2.5. Environment and Equipment

Adverse physical work environment constituents and excessive work demands like extreme heat, pressure, poor lighting, noise or work overload/ overtime, time pressure, extreme physical activity can affect employees' mental well-being, causing adverse social and psychological effects. Therefore, creating a pleasant atmosphere that eventually enhances efficiency is crucial for a working setting (Rout and Rout, 2002). Also when it comes to the equipment used performing a task; it can be clearly seen that equipment availability, suitability, and maintenance have a vital importance.

2.2.6. Organizational Culture

Schein (1992) defined organizational culture as;

"…a pattern of shared basic assumptions that the group learned as it evolved its problems of external adaptation and internal integration. Over time this pattern of shared assumptions has worked well enough to be considered valid and, therefore, to

be taught to new members as the correct way you perceive, think and feel about those problems." (Schein, 1992).

According to Roughton *et al.* (2019); the essential components, values, standards, convictions, and practices may contribute to establish a safety culture or may become an obstruction to progressing that culture. In order to reinforce positive safety attitude and spread it throughout the organization, commitment and everyday feedbacks from the management plays a key role (Roughton *et al.*, 2019).

2.2.7. Interpersonal Relationships at Work

Interpersonal relationship at work refers to the social association, connection or affiliation between the people in an organization (Nwinyokpugi and Omunakwe, 2019).

Workplace interpersonal relationship is the social association, connection or affiliation between two or more people in an organization. Interpersonal working relationships are regarded as an important part of psychosocial working circumstances, but there are restricted research related to interpersonal working relationships to distinct health results. The most researched dimension of interpersonal relationships linked to mental health, such as, depression or absence of social support. According to WHO, depression is one of the top ten health issues in the globe today (Stoetzer, 2010).

Interpersonal relationship in the workplace is a very significant point that affects amount of productivity of employees in any organization. Members or employees within the organization should communicate efficiently with their superiors,

subordinates and co-workers. Their level of viability and productivity are determined by how they relate with clients, vendors, and the general public outside the organization's operational base. Previous interpersonal relationship studies have shown that the organization's operation depends on employee behavior. The higher the relationship density within the organization, the higher the effect on the effectiveness and productivity of the organization (Nwinyokpugi and Omunakwe, 2019).

Moreover, social support is one of the most researched dimension of interpersonal working relationships. Generally, social support is described as helpful social interactions that are often split into instrumental support, such as providing the person with the resources or data required to perform the duties required and providing emotional support, such as backup, personal feedback, and appreciation (Stoetzer, 2010).

Social support is regarded as a beneficial aspect of interpersonal relationships counterbalancing other psychosocial adverse factors in the workplace. On the other hand, the absence of social support is not limited to a mere absence of beneficial buffering, but can generate stress or tension on its own. In regards to the level of assistance anticipated from peers, staff or managers, one way social support can contribute to stress. Usually the interpersonal interaction norms and traditions developed set the standard for what we consider to be the minimum amount of assistance. Lower support concentrations can lead to stress owing to a sense of safety loss (Stoetzer, 2010).

2.2.8. Role in Organization

A person's role in an organization is described with his responsibilities and communication depending on his position. When these are not designated very well in an organization, people may experience role ambiguity or conflict (Palomino and Frezatti, 2016).

For instance, role ambiguity occurs when it is not certain that what an employee needs to do with a job needs to be done. This is caused by insufficient information and unwritten job definition. Role conflict is also another source of psychosocial burden occurs when an employee is supposed to play more than one role. On the other hand, job satisfaction can be defined as a state in a working medium which is supportive for a good work performance as well as employees mental health. From this point of view, role conflict and role ambiguity are one of the most negative contributors to job satisfaction of employees in an organization (Palomino and Frezatti, 2016).

Responsibility also is another factor defining an employee's role in the workplace and mostly, it might be a stress causing factor. Responsibility may be both for things and for the people, which causes more stress and negative health outcomes. There are some studies prove that heart health of the employees with responsibility for things are better when compared with responsibility for people. Also, air traffic controllers who have more responsibility for people's lives are found to be more prone to heart attack (Rout and Rout, 2002). On the other hand, it must be recognized that too little responsibility can also be an individual's cause of stress.

2.2.9. Career Development

Issues about career development, such as future anxiety, under/over promotion, job insecurity can lead to employees stress, causing disconnection, ineffectiveness, and poor relationships between coworkers (Rout and Rout, 2002).

Over promotion is the situation happens when an employee is promoted to a position that he/she did not have sufficient skills or experience to execute it. That may result in low self confidence, work overload and thus work stress. Under promotion is the lack of chance to promote of an expert employee and it can also be a cause of stress (Rout and Rout, 2002).

Job insecurity is also a serious cause of physical and psychological in other words, fear of losing the job is a main stress cause. Fear of work loss was found to be related with health problems (Rout and Rout, 2002).

2.2.10. Work-Home Interface

There have been some changes in the job and home domains over the past decades in western world. Work requirements have risen excessively as a result of these innovations. However, one of the most important demographic modifications is the increasing workforce and women's involvement. This has resulted the increase of dedicated time of work role. In addition, a lot of individuals have to look after elderly parents as well (Spillman and Pezzin, 2000). As a result of increasing rates of divorce, single parent families are also becoming more common. It is harder for single parents and co-parents to combine job and homework (Spillman and Pezzin, 2000).

Because of the above-mentioned modifications in people's job and home life in developed countries, organizations are not capable of meeting the work-home needs of their seperated labourforce (Christensen, 2005). This nonfulfillment leads to several adverse effects on employees in terms of occupational health and safety. Work-family conflict has serious consequences on not only employees' physical and psychological states but also organization's future.

The researches showed the relation between health conditions and work-family conflict(WFC). WFC is related to depression, hypertension, alcohol consumption and mood disorders like anxiety (Eby *et al.*, 2005). On the other hand, a great number of studies indicate that the organization may also be affected by WFC. Many studies, for example, discovered that WFC was associated with reduced job satisfaction, time-based conflicts, higher turnover intentions, lower perceived career success and career satisfaction (Parasuraman and Simmers, 2001; Bruck *et al.*, 2002; Greenhaus *et al.*, 2001).

2.3. Air Traffic Control Job and Its Psychosocial Aspects

2.3.1. Air Traffic Control Job

Air traffic control, being an integral part of air traffic management, is the process of separating aircrafts, aiming to avoid airspace accidents and to retain well-organized and effective flow of air traffic. The airspace is structured by dividing into bordering sections. The rules and agreements assigned between countries is based while giving air traffic control service (Arvidsson, 2006).

Air traffic control service is provided with the aim of:

(i) Preventing crashes: not only between aircrafts but also between aircraft and obstructions in the maneuvering area (which includes the runway for landings and departures, taxiways and courtyards)

(ii) Ensuring a fast and effective air traffic (Arvidsson, 2006).

Air traffic control is divided into three categories of controlling: aerodrome control, approach control, and area control, with the order of magnitude of the controlled space.

To make it clearer, the flight control path of any passenger flight needs to be explained. The aircraft starts its flight under the control of departure aerodrome control, then it is respectively transferred to departure aerodrome control, departure approach control, area control, destination approach control and finally to arrival aerodrome control unit (Gander, 2001).

Aerodrome control unit manages all aircraft on the ground and all aircraft flying in the vicinity of an aerodrome; during landing, maneuvering, and take-off phases of the flight. Aerodrome control unit takes over the control of the aircraft when it starts approaching the runway; transfers the aircraft to the approach control unit once it is airborne (Gander, 2001).

The unit provides information and permits to the airplanes under the control of airport control towers aiming to provide the safety of the traffic on and around the airport and

speed up the continuous flow of this traffic. It is responsible for preventing the collision of; aircrafts flying around the airport, moving on the maneuvering area and aircrafts landing and taking off with each other and obstacles and also preventing the collision of aircrafts and the vehicles moving on the maneuvering area.

Approach control unit is responsible for arriving and departing aircraft during they are in the designated ‘‘terminal airspace’’ around the airport. The approach control unit takes the responsibility of the departed aircraft which is transferred by the control tower, provides necessary separation and flight level and then transfers it to the area control center safely. In the same way, the unit takes the responsibility of the descending aircraft which is transferred by the area control center, provides necessary separation and flight level and finally transfers it to the aerodrome control center safely. Briefly, the approach control unit acts as a bridge between the aerodrome control and the area control.

Area control unit is responsible for managing the flight during en-route phase and right after/before approach or departure phase in the scope of designated area (Gander, 2001). The en-route phase of flight is defined as that segment of flight from the termination point of a departure procedure to the origination point of an arrival procedure. In other words, en-route phase is the longest phase of flight. This makes area control unit the most complex and challenging one among other units of control.

2.3.2. Air Traffic Controllers and The Occupational Challenges

Air traffic controllers are individuals trained in the worldwide air traffic control system to keep the secure flow of air traffic. Air traffic controllers apply many laws in their region of responsibility to maintain aircraft safe from each other and to move

all aircraft securely and effectively through their allocated airspace industry. As well as transmitting suggestions, data and instructions to pilots on the ground through radiotelephony, collaborating with various supporting divisions and using technological advances.

Aircraft flying from one destination to another may not take off and fly randomly. The airplane is needed to fly on pre-determined air paths and comply with air traffic controllers ' orders. The pilots are therefore needed to receive clearance and guidelines from the air traffic controllers on issues ranging from engine start-up clearance, take-off, airspace flight, flight level to climb or descend, airplane velocity changes, landing and ground motions. A single air traffic controller can be simultaneously responsible for many aircraft.

While air traffic controller responsibilities differ based on region, approach and airport controller positions, the main responsibilities of air traffic controllers are as follows:

• Ensuring flight safety first and foremost,

• Giving directions for climbing or descending and vectors to maintain a secure, orderly and fast flow,

• Distinguishing aircraft, obstructions and ground cars from other aircraft,

• Providing aircraft with all data, such as weather, anticipated approach, and

• Managing unexpected incidents, unplanned traffic and emergencies, including search and rescue unit coordination (SHGM, n.d.).

Air traffic controllers' duties are complicated and cognitively demanding (Truschzinski *et al.*, 2018). Cognitive skills required to perform the job include reasoning, definition, situation awareness protection, planning, fast and accurate decision-making and rapid verbal communication skills about the flow of aircrafts in a certain airspace and time. The job comes with a heavy mental workload and is still quite demanding about information processing, decision-making, and problem solving despite technological innovations that provide assistance to the controller perform the job in a secure and effective manner. Furthermore, all the controllers are conscious of the great responsibility engaged in the work (Arvidsson, 2006); which is, for this reason, considered as one of the world's most stressful and difficult professions.

Another important point to consider is that these mental demands and their outcomes differs according to the type of air traffic control job (aerodrome control, approach control, and area control) performed. As previously mentioned, because of the content and magnitude of airspace under their responsibility, area controllers are carrying out the most complicated and challenging task compared to other air traffic controllers.

Since they control a large number of aircrafts at the same moment, the slightest mistake can cause incidents threatening not only a lot of people in aircrafts but also the people and facilities in residential areas. Therefore, area controllers' mistakes compared to others' would be much more destructive in terms of consequences. With the awareness of this huge responsibility for people, area controllers are exposed to several stressors performing their job. Consequently, further research should be conducted on area controllers in order to meet increasing demands efficiently and ensure safety. Moreover, greater attention to the psychosocial aspects of this specific job should be given (Arvidsson, 2006).

CHAPTER 3

SCALE DEVELOPMENT: PSYCHOSOCIAL RISK FACTORS MEASUREMENT

3.1. Introduction

Survey is one of the most commonly used research designs in social sciences. It is a flexible research approach used to investigate a wide range of topics. It is particularly useful for non-experimental descriptive designs that seek to describe reality. Surveys often employ the questionnaire as a tool for data collection.

A questionnaire study strategy (usually cross-sectional) had been the dominant methodology in occupational stress studies involving workers' self-reporting of work features and health complaints, the former achieving "stressor" status if co-related with the latter (Murphy and Hurrell, 1987). While this method was fast and cost-effective (especially when studying big population groups) and has produced some significant results, it is quite evident that there are many issues. As Jenkins *et al.* (1984) mentioned in their review and evaluation of psychometric stress assessment methodologies, no single job stress measurement questionnaire presently used has such comprehensive psychometric assistance and is so free of methodological challenges that it can be recommended without reservation. The use of abbreviated and unstandardized scales for measuring variables was a recurring practice. These scales are often borrowed from earlier studies, but then reduced in size without analyzing the old or new data to determine the effects on the psychometric properties of the scales. In the literature, the average scale of 3 items in duration is prevalent. Investigators using such brief scales often do not quote reliability numbers, if quoted, they are generally internal consistency estimates based on a strategy, such as the

Spearman-Brown Prophecy Formula, which allows a projection of what scale reliability would be if multiple times longer. It can also be anticipated that such scales will usually have low validity.

Another significant issue is that scales are rarely reused as they were first created (Murphy and Hurrell, 1987; Jenkins *et al.*, 1984). This, together with the use of unknown validity and reliability scales, contributes to an issue of unknown degrees of non-comparability and delays the development of a much-needed normative database to compare stress concentrations in particular occupational groups.

Some work stress questionnaire study surveys have failed to differentiate properly between stressor measurements and subsequent stress measurements (Kasl, 1978). Others distinguish between stressors, strain and physical and mental health results, but fail to demonstrate the relationship individually. The intervention or modification of variables is considered by very few questionnaire research. Even fewer consider sources of stress outside the job setting that may exacerbate or communicate with work-related issues in other respects (Murphy and Hurrell, 1987).

The above-mentioned issues point to a need for a valid and reliable generic questionnaire tool (or at least a key set of scales) that can be implemented across job circumstances. This generic tool could be added to tailor-made or selectively altered scales as the need arises to capture the idiosyncratic variables that complicate any specific occupation. Such a generic tool would allow a psychometric database to be accumulated that would allow comparisons across occupations. Indeed, due in part to the increasing number of worker compensation lawsuits related to stress and the concurrent and growing need for organizations to document the efficiency of stress

reduction and stressor decrease measures, there was increasing pressure for such a tool (Ivancevich *et al.*, 1985).

3.2. NIOSH Generic Job Stress Questionnaire (N-GJSQ)

NIOSH created a generic tool in 1988, using these analyzes and suggestions and in-house knowledge in this region as a result of the rising need. N-GJSQ measured psychosocial exposure (workload, responsibility, role demands, mental demands, conflict, skill underuse, employment opportunities, types of job control, *etc.*); individual strain (depression, somatic complaints, job dissatisfaction, illnesses) and stress-strain mediators (social support, self-esteem) with the aim of assessments of job characteristics, psychosocial factors, physical conditions, safety hazards, stress, health and job satisfaction (Tabanelli *et al.*, 2008). N-GJSQ is a very comprehensive questionnaire which originally includes 23 constructs and 216 questions shown in the Table 3.1.

Table 3.1. *Constructs and Measures Included in NIOSH Generic Job Stress Questionnaire (NIOSH,n.d.)*

Construct	*Number of Items*
Health Conditions	24
Type A Personality	20
Affective Reaction	20
Domestic Complaints	17
Interpersonal Conflict	16
Job Control	16
Social Support	12
Quantitative Workload	11
Physical Environment	10
Self-Esteem	10

Table 3.1. *Constructs and Measures Included in NIOSH Generic Job Stress Questionnaire (Cont'ed) (NIOSH,n.d.)*

Construct	*Number of Items*
Role Conflict	8
Non-Work Activities	7
Role Ambiguity	6
Cognitive Demands	5
Work Disability	5
Job Future Ambiguity	4
Perceived Employment Opportunities	4
Responsibility for People	4
Shiftwork	4
Job Satisfaction	4
Variance in Workload	3
Utilization of Abilities	3
Behavioral Acute Reactions	3

As can be seen from Table 3.1, the N-GJSQ contains constructs to measure a large spectrum of different subjects. Since the aim of the scale is to provide a comprehensive questionnaire for stress studies, it contains constructs with many elements that can be used for various researches.

3.3. Development of Psychosocial Risk Factors Assessment Scale

As mentioned before, a comprehensive literature study on psychosocial risk factors assessment scales had been conducted by the researcher and finally N-GJSQ is found out to be the most suitable and comprehensive one to help developing a new scale for psychosocial risk factors scale for this study.

Since the aim of the study is to measure psychosocial risk factors in air traffic controllers, an assessment is needed to select the appropriate elements for the purpose of the study. Current constructs and items were evaluated through expert opinions and literature review. After this assessment, the constructs that were determined not to contribute to the study objectives were excluded. As a result of this process, 5 items which are “workload and responsibility”, “conflict at work”, “social support”, “your job future”, and “job satisfaction” were reviewed and included in the new scale.

As a result of the study, the relationship between psychosocial risk factors and working conditions of air traffic controllers is also wanted to be examined. After the literature review and gathering expert opinions, “working conditions” element was also included in the scale. As a result of all these studies, the psychosocial risk factors scale consisted of 13 demographic questions and 37 psychosocial risk factor questions was created.

The 37 questions were distributed under 6 constructs. There were 9 questions to assess workload and responsibility, 7 questions to assess conflict at work, 8 questions to assess social support, 6 questions to assess working conditions, 4 questions to assess your job future, and 3 questions to assess job satisfaction.

Since the N-GJSQ included many constructs which have the questions with different answering methods, such as various multiple choices scaled between 2-7 answers, fill in the blanks or open-ended questions, the need to standardize the ratings of the new scale’s items has arose. For this reason, psychosocial risk assessment scale was adapted to a five-point Likert scale. The items in the scale were rated from 1 to 5, from strongly disagree to strongly agree. This standardization allowed the study to evaluate the factors much easier and correctly.

Since the original NIOSH Generic Job Stress Questionnaire was available in English language and the air traffic controllers' English language knowledge is highly sufficient due to their job requirements, the new questionnaire was created in English language.

As a result of these development studies, psychosocial risk factors assessment scale consisted of 13 demographic questions and 37 psychosocial risk factor questions under 6 constructs in adaption with Likert scale in English was developed and explained in Table 3.2.

Table 3.2. *Constructs and Measures Included in Psychosocial Risk Factors Scale*

Construct	*Number of Items*
Workload and Responsibility	9
Conflict at Work	7
Social Support	8
Working Conditions	6
Your Job Future	4
Job Satisfaction	3

Following the development of the scale, METU Human Subjects Ethic Committee approval was obtained from the Applied Ethics Research Centre of Middle East Technical to use the questionnaire.

The final version of the Psychosocial Risk Factors Scale used in the study is presented in Appendix A. The final factor structure developed after the statistical analysis of the main study was presented in the Results section of the Chapter 4.

CHAPTER 4

IMPLEMENTATION AND RESULTS

4.1. Survey Implementation Process

Psychosocial risk assessment scale development is followed by implementation of the questionnaire to the target audience, the air traffic controllers working at DATCCT. Before starting the scale implementation, all the survey universe, namely 299 air traffic controllers employed in DATCCT are aimed to be reached. However, since some of them were temporarily assigned to work at different locations, this study was applied to 230 air traffic controllers working at DATCCT. Prior to distribution of the questionnaires, controllers were asked if they would volunteer to participate in this survey and were given an exploratory information about the study. They were also informed about approval of METU Human Subjects Ethic Committee and a copy of the approval was hung on the wall of common room in case they wanted to see. Four shifts were visited by the researcher in person to apply psychosocial risk assessment scale. Questionnaire forms were distributed by the researcher under the supervision of the shift managers during shift breaks by asking them to fill out paper copies.

Participants were asked not to write their names since the questionnaire was anonymous. To make sure that there were no doubts related to anonymity of the survey, all the questionnaires were filled out onto paper copies. Avoiding online survey method assured participants that no information such as their IP addresses or ID numbers was collected beyond their knowledge. The participants were also informed that this was a voluntary participation study.

After the application of the questionnaires were completed through all four working shifts, questionnaire forms were collected to start the statistical assessment of the data. The data gathered from the questionnaire was processed through SPSS Statistics 23 programme for statistical analysis. While transferring the data to the SPSS, the items in the scale which were rated 1 to 5, from strongly disagree to strongly agree were reversed, meaning 1 refers strongly agree, while 5 refers strongly disagree. The results were assessed and interpreted accordingly. The results of these analyses were given in the following part in detail.

4.2. Results

4.2.1. Exploratory Factor Analysis and Reliability Tests of the Scale

Factor analysis (FA) is a multivariate statistical method which dates back 100 years and is widely used in the areas of information system, psychology, trade and education and is regarded the preferred approach to interpreting self-reporting surveys. FA decreases a big amount of variables (factors) to a narrower set. It also sets the fundamental dimensions between measured variables and latent constructs, thus enabling the theory to be formed and refined. It also offers proof of the validity of self-reporting scales (Taherdoost *et al.*, 2014).

Two types of factor analysis were explained in the study of Taherdoost *et al.* (2014) in detail: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). When the researcher does not expect the amount or nature of the variables, EFA is used. As the name indicates, it enables the researcher to investigate the primary variables to generate a hypothesis or model from a comparatively big number of latent aspects that are often represented by a set of items. To put it simple, exploratory factor

analysis is a complicated and multivariate statistical method widely used in information system, social science, education, and psychology.

In contrast, CFA as a type of structural equation modeling (SEM) is used by investigator or model to evaluate the suggested hypothesis. Unlike EFA, CFA has hypotheses and expectations based on a priori model and theory of the amount of constructs and which best fit concepts or models.

While both EFA and CFA techniques attempt to account for as much variability as possible in a set of observed variables with a narrower set of latent variables, factors, or elements, EFA is primarily appropriate for scale growth and implemented when there is little theoretical foundation to a priori specify the amount and patterns of prevalent factors (Taherdoost *et al.*, 2014).

As the first step of the statistical analysis, EFA was conducted for the psychosocial risk assessment scale and the factor structure of the scale was examined by using principal component factor extraction method.

There are some criteria to be met in order to perform factor analysis. The sampling amount and the data set should be appropriate for the factor analysis. These requirements are controlled by two tests; Kaiser-Meyer-Olkin (KMO) coefficient calculation and Bartlett's sphericity test. Findings of these two tests were displayed in Table 4.1.

KMO test is used to check the suitability of the sample size in factor analysis. Factor analysis is not continued if the KMO value is less than 0.50. If the KMO value is less

than 0.50, it means that more data is needed to be processed. Based on the KMO value of the sample, the following comments are made about the sample size:

- 0.50-0.60 “bad ”,
- 0.60-0.70 “weak”,
- 0.70-0.80 “medium”,
- 0.80-0.90 “good“
- Above 0.90 “perfect”.

On the other hand, Bartlett test is used to determine whether the data come from a multivariate normal distribution. As a result of this test, a chi-square value is obtained and the significance value (p) is examined. If the significance value is greater than 0.05, it is concluded that factor analysis results are not available. If the significance value is less than 0.05, the data is said to come from a multivariate normal distribution and the analysis is continued.

Table 4.1. *KMO Value and Bartlett Sphericity Test Results*

Kaiser Meyer Olkin (KMO)		0.771
Bartlett Sphericity Test	X^2	228.269
	Sd	325
	p; Significance level	0.000*

When Table 4.1 is examined, KMO value was found to be 0.771. Thus, the number of samples was found to be sufficient to apply factor analysis to the data. As a result of the Bartlett sphericity test, the p value calculated was less than 0.05; thus it was concluded that there were significantly high relationships between the variables and the data were suitable for applying factor analysis ($p < 0.05$).

As a conclusion, both KMO and Bartlett's test results showed that the sample size was sufficient for the factor analysis and the p value obtained from the Bartlett sphericity test was suitable for the factor analysis of the data for 50-item of the psychosocial risk assessment scale (Table 4.2).

Following the necessary criteria were checked and the scale was found to be suitable for factor analysis, exploratory factor analysis was performed. Eigen Value is used to calculate the variance explained by the factors and to decide the number of factors. In general, factors with Eigen values above 1 are considered important. As a result of factor analysis, 7 factors with Eigen value greater than 1 were observed. (Table 4.2). The contribution of these seven factors to total variance was found to be 64%.

Explained total variance indicates the strength of the factor structure of the scale. It is an indicator of how much of the factors explained the total scale items. The number of factors covered by the amount of 2/3 of the total variance related to the variables included in the analysis is considered as the number of significant factors. In practice, especially in the behavioral sciences, it is difficult to reach this amount in scale development. There are two ways to increase the total variance described: increasing the number of factors and searching for higher load value in item selection. Keeping the number of factors high in multifactorial patterns increases this ratio, but it may be difficult to name the factors. This requires very good command of the area. In the

social sciences, the variance explained for multifactorial patterns should be between 40% and 60%. Percentages of explained variance of the factors in psychosocial risk assessment scale were indicated in Table 4.2.

Table 4.2. *Total Variance Explained*

Factor	**Initial Eigen Values**			**Total Factor Loads (Rotated)**		
	Total	**Described Variance%**	**Cumulative%**	**Total**	**Described Variance%**	**Cumulative%**
Factor 1	5.231	20.118	20.118	3.161	12.156	12.156
Factor 2	3.890	14.963	35.080	2.736	10.523	22.679
Factor 3	2.163	8.320	43.400	2.299	8.843	31.522
Factor 4	1.674	6.437	49.837	2.298	8.837	40.359
Factor 5	1.379	5.303	55.140	2.245	8.633	48.992
Factor 6	1.242	4.777	59.917	2.132	8.200	57.192
Factor 7	1.182	4.545	64.462	1.890	7.270	**64.462**

When Table 4.2 is examined, it is observed that “Factor 1” sub-dimension represents 12.156% of the total variance, while “Factor 2” represents 10.523%, “Factor 3” represents 8.843%, “Factor 4” represents 8.837%,, “Factor 5” represents 8.633%,, “Factor 6” represents 8.200% and “Factor 7” represents 7.270%. These 7 sub-dimensions together account for 64.462% of the total variance.

There is a common view that the factor load value of the item should be at least 0.30. Items below this load value are eliminated. It is also stated that the load value should be 0.32, 0.40, 0.45. Regardless of the sign, the load value of 0.60 and above is high; the load value between 0.30-0.59 is defined as medium magnitude. As the sample size increases, the load value to be considered decreases. For example;

- At least 350 sample size for 0.30 load value,
- At least 200 sample size for 0.40 load value,
- At least 120 sample size for 0.50 load value,
- At least 85 sample size for 0.60 load value,
- At least 60 sample size for 0.70 load value.

Considering the sample size of the study is more than 200, items with factor load less than 0.40 were removed from the structure. Also for items that give high load values in both factors, it is checked whether the difference between two high load values is at least 0.10. If the difference between the load values is less than 0.10, this item is considered as an overlapping item and is discarded from the structure.

For the beginning, the scale was consisted of 37 items and statistical analysis was started to be made with these items. Since the items 17, 19, 30, 35, 36, 40 and 41 were found overlapping and the items 38 and 39, 42 and 43 were found to create two-itemed factors, they were excluded from the structure as a result of the exploratory factor analysis. Thus, total of 26 items were remained in the psychosocial risk assessment scale. The factor structure of the psychosocial risk assessment scale and factor loadings are shown in Table 4.3.

Table 4.3. *Factor Loads of the Items of the Scale*

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
S23	0.789						
S25	0.765						
S27	0.689						
S31	0.664						
S37	0.498						
S26		0.819					
S28		0.818					
S29		0.769					
S24		0.582					
S48			0.840				
S49			0.814				
S50			0.682				
S45				0.772			
S46				0.764			
S44				0.755			
S47				0.573			
S15					0.746		
S14					0.625		
S18					0.614		
S16					0.584		
S21						0.899	
S20						0.898	
S22						0.523	
S34							0.741
S32							0.709
S33							0.647

When Table 4.3 is examined, it can be seen that all items have a factor load above 0.400.

Right after the factor analysis is completed, reliability analyses were performed for the seven factors of the questionnaire developed by the researcher. Cronbach Alpha

internal consistency coefficients were examined in order to determine the reliability of the confirmed measurement tools (Table 4.4).

Table 4.4. *Reliability Analysis Results of Scale and Sub-dimensions*

	Number of Items	**Cronbach Alpha**	**Reliability Level**
Factor 1	5	0.780	Reliable
Factor 2	4	0.789	Reliable
Factor 3	4	0.797	Reliable
Factor 4	3	0.715	Reliable
Factor 5	4	0.709	Reliable
Factor 6	3	0.754	Reliable
Factor 7	3	0.711	Reliable
Total	**26**	**0.752**	**Reliable**

It can be observed from the Table 4.4 that all seven factors showed acceptable levels of reliability (α>0.700). The Cronbach's alpha for internal consistency score for the scale with 26 items was found as .75.

Table 4.5. *Descriptive Statistics for Sub-dimensions*

n=230	**Average**	**St. Deflection**	**Minimum**	**Maximum**
Factor 1	2.43	0.66	1.00	4.40
Factor 2	2.97	0.76	1.00	5.00
Factor 3	1.96	0.68	1.00	5.00
Factor 4	3.10	0.79	1.00	5.00
Factor 5	2.71	0.74	1.00	4.50
Factor 6	2.60	0.89	1.00	5.00
Factor 7	2.20	0.62	1.00	4.33

While the mean of Factor 1 was 2.43, Factor 2 was 2.97, Factor 3 was 1.96, Factor 4 was 3.10, Factor 5 was 2.71, Factor 6 was 2.60, and Factor 7 was 2.20.

Following the factor analysis and the other tests, remaining 26 items are found to be loaded under 7 reliable factors. Those 7 factors are named according to the items included.

- Factor 1: Group Harmony
- Factor 2: Group Conflict
- Factor 3: Job Satisfaction
- Factor 4: Job Future
- Factor 5: Workload
- Factor 6: Responsibility
- Factor 7: Immediate Supervisor & Authority

After collection of the questionnaires, data from 230 valid questionnaires were entered the SPPS Statistics 23 programme for statistical analysis. Demographic information of the participants is shown in Table 4.6.

4.2.2. Demographic Characteristic of the Participants

61.3% of the participants were aged between 23–35 years and 38.7% of the participants were aged over 35 years. The average age of the participants were 35.31 years. The percentages of female and male participants were 44.8% and 55.2%, respectively (Table 4.6).

Table 4.6. *Demographic Characteristic of the Participants*

Demographic Variables	**Frequencies**	**Percentages**
	N	%
Age		
23-35	141	61.3
>35	89	38.7
Total	**230**	**100.0**
Gender		
Female	103	44.8
Male	127	55.2
Total	**230**	**100.0**
Marital Status		
Married	161	70.0
Single	69	30.0
Total	**230**	**100.0**
Level of Education		
High School	8	3.5
Graduate	201	87.4
Post Graduate (Master/PhD)	21	9.1
Total	**230**	**100.0**
ATC Experience		
1-9 Years	123	53.5
≥10 Years	107	46.5
Total	**230**	**100.0**
ATC Experience at DATCC		
1-5 Years	121	52.6
>5 Years	109	47.4
Total	**230**	**100.0**
Working Unit		
Area Control Unit	172	74.8
Approach Control Unit	19	8.3
Area and Approach Control Unit	39	17.0
Total	**230**	**100.0**

Table 4.6. *Demographic Characteristic of the Participants (Cont'ed.)*

Demographic Variables	**Frequencies**	**Percentages**
	N	%
*Working Position **		
Assistant ATC	11	4.8
Team Chief	7	3.0
Lecturer	1	0.4
ATC	207	90.0
OJTI	33	14.3
Chief ATC	2	0.9
APP Chief	1	0.4
FMP	4	1.7
Other (Please Specify)	1	0.4
Total	**230**	**100.0**
Shift Work		
Rotating twelve-hour shift	216	93.9
Permanent day shift	14	6.1
Total	**230**	**100.0**
OHS Training		
Yes	199	86.5
No	31	13.5
Total	**230**	**100.0**
Ergonomy Knowledge		
Yes	139	60.4
No	91	39.6
Total	**230**	**100.0**
Ergonomic Work Environment		
Yes	86	37.4
No	90	39.1
No idea	54	23.5
Total	**230**	**100.0**

*: In this question, participants were able to select more than one option.

As seen from the Table 4.6, the majority of the participants were married (70.0%), followed by single (30.0%). 87.4% were university graduates, 9.1% were post graduates and 3.5% were high school graduates. 53.5% of the participants were working as an air traffic controller for 1-9 years and 46.5% of the participants were working as an air traffic controller for 10 years and more. 52.6% of the participants were working as an air traffic controller at DATCCT for 1-5 years and 47.4% of the participants were working as an air traffic controller at DATCCT for over 5 years. The majority of the participants were working as an air traffic controller (ATC) (90.0%), followed by on the job training instructors (OJTI) (14.3%), assistant air traffic controller (4.8%), team chief (3.0%), flow management position (FMP) (1.7%); approach chief (0.4%), lecturer (0.4%), and other (0.4%).

Most of them were working in rotating twelve-hour shifts (93.9%) and the rest were working in permanent day shifts. In terms of occupational health and safety training, 86.5% of the participants received OHS training. 60.4% of them have information about ergonomic working principles; while 39.1% think that the working environment is not suitable for ergonomic conditions.

4.2.3. Effects of Demographic Variables on the Factors

When Table 4.7 is examined, there is a statistically significant difference between- “Factor_1 ”,“ Factor_2 ”,“ Factor_5 ”,“ Factor_6 ”and“ Factor_7 ”scores between 23-35 and > 35 age groups ($p < 0.05$). Accordingly, “Factor_1”, “ Factor_2 ”,“ Factor_5”, “Factor_6” scores of the 23-35 age group were significantly higher than those in the > 35 age group, whereas “ Factor_7 ” scores were significantly lower.

Table 4.7. *Examining the Differences of Factors by Age*

		Count	Mean	Standard Deviation	t	p
Factor _1	23-35	141	2.54	0.70	3.410	**0.001***
	>35	89	2.26	0.56		
Factor _2	23-35	141	3.06	0.74	2.053	**0.041***
	>35	89	2.85	0.78		
Factor _3	23-35	141	2.01	0.69	1.298	0.195
	>35	89	1.89	0.67		
Factor _4	23-35	141	3.11	0.79	0.122	0.903
	>35	89	3.09	0.81		
Factor _5	23-35	141	2.84	0.72	3.622	**0.000***
	>35	89	2.49	0.73		
Factor _6	23-35	141	2.69	0.89	2.120	**0.035***
	>35	89	2.44	0.88		
Factor _7	23-35	141	2.12	0.60	-2.457	**0.015***
	>35	89	2.32	0.62		

t: Independent Samples t Test p<0.05 (statistically significant)

Table 4.8. *Examining the Differences of Factors by Gender*

		Count	Mean	Standard Deviation	t	p
Factor_1	Female	103	2.33	0.60	-2.057	**0.041***
	Male	127	2.51	0.70		
Factor_2	Female	103	2.96	0.70	-0.337	0.737
	Male	127	2.99	0.81		
Factor_3	Female	103	1.88	0.61	-1.682	0.094
	Male	127	2.03	0.72		
Factor_4	Female	103	3.02	0.70	-1.403	0.162
	Male	127	3.17	0.86		
Factor_5	Female	103	2.63	0.66	-1.400	0.163
	Male	127	2.77	0.80		
Factor_6	Female	103	2.51	0.82	-1.372	0.171
	Male	127	2.67	0.94		
Factor_7	Female	103	2.20	0.57	-0.043	0.965
	Male	127	2.20	0.65		

t: Independent Samples t Test p<0.05 (statistically significant)

When Table 4.8 is examined, there is a statistically significant difference between men and women ($p < 0.05$). According to this, "Factor 1" scores of males are significantly higher than females.

Table 4.9. Examining the Differences of Factors by Marital Status

		Count	Mean	Standard Deviation	t	p
Factor_1	Single	69	2.43	0.74	0.012	0.990
	Married	161	2.43	0.63		
Factor_2	Single	69	2.78	0.78	-2.588	**0.010***
	Married	161	3.06	0.74		
Factor_3	Single	69	2.06	0.78	1.457	0.146
	Married	161	1.92	0.63		
Factor_4	Single	69	3.08	0.89	-0.270	0.787
	Married	161	3.11	0.75		
Factor_5	Single	69	2.54	0.70	-2.283	**0.023***
	Married	161	2.78	0.75		
Factor_6	Single	69	2.46	0.86	-1.541	0.125
	Married	161	2.66	0.89		
Factor_7	Single	69	2.17	0.64	-0.484	0.629
	Married	161	2.21	0.61		

t: Independent Samples t Test $p<0.05$ (statistically significant)

When Table 4.9 is examined, there is a statistically significant difference between "Factor_2" and "Factor_5" scores of single and married ATCs ($p < 0.05$). According to this, "Factor_2" and "Factor_5" scores of married ATCs were significantly higher than single ones.

When Table 4.10 is examined, it is seen that there is no statistically significant difference in terms of factor scores between graduate and post graduate participants ($p > 0.05$).

Table 4.10. *Examining the Differences of Factors by Level of Education*

		Count	Mean	Standard Deviation	t	p
Factor_1	Graduate	201	2.43	0.65	-1.507	0.133
	Post Graduate (Master/PhD)	21	2.66	0.80		
Factor_2	Graduate	201	2.97	0.76	0.325	0.745
	Post Graduate (Master/PhD)	21	2.91	0.81		
Factor_3	Graduate	201	1.95	0.68	-1.752	0.081
	Post Graduate (Master/PhD)	21	2.22	0.64		
Factor_4	Graduate	201	3.07	0.78	-0.730	0.466
	Post Graduate (Master/PhD)	21	3.20	0.85		
Factor_5	Graduate	201	2.69	0.76	-0.565	0.573
	Post Graduate (Master/PhD)	21	2.78	0.63		
Factor_6	Graduate	201	2.61	0.90	0.501	0.617
	Post Graduate (Master/PhD)	21	2.51	0.76		
Factor_7	Graduate	201	2.21	0.63	-8.894	0.372
	Post Graduate (Master/PhD)	21	2.33	0.42		

t: Independent Samples t Test

When Table 4.11 is analyzed, there is a statistically significant difference between the ATCs work experiences in terms of “Factor_1”, “Factor_3”, “Factor_5” and “Factor_6” scores ($p<0.05$). Accordingly, “Factor_1”, “Factor_3”, “Factor_5”, “Factor_6” scores of the ATCs with a work experience between 1-9 years were significantly higher than those of the ones with work experience 10 years or more.

Table 4.11. *Examining the Differences of Factors by Work Experience as an ATC*

		Count	Mean	Standard Deviation	t	p
Factor_1	1-9 Years	123	2.58	0.71	3.848	**0.000***
	≥10 Years	107	2.26	0.56		
Factor_2	1-9 Years	123	3.06	0.76	1.876	0.062
	≥10 Years	107	2.87	0.76		
Factor_3	1-9 Years	123	2.07	0.75	2.528	**0.012***
	≥10 Years	107	1.84	0.57		
Factor_4	1-9 Years	123	3.10	0.75	-0.076	0.940
	≥10 Years	107	3.11	0.84		
Factor_5	1-9 Years	123	2.86	0.73	3.381	**0.001***
	≥10 Years	107	2.53	0.72		
Factor_6	1-9 Years	123	2.75	0.89	2.865	**0.005***
	≥10 Years	107	2.42	0.86		
Factor_7	1-9 Years	123	2.14	0.60	-1.619	9.107
	≥10 Years	107	2.27	0.63		

t: Independent Samples t Test p<0.05 (statistically significant)

When Table 4.12 is examined, there is a statistically significant difference between "Factor_1", "Factor_2", "Factor_5" and "Factor_6" scores between the ATC working experiences at DATCCT ($p<0.05$). According to "Factor_1", "Factor_2", "Factor_5" and "Factor_6" scores of the ATCs working at DATCCT between 1 and 5 years are significantly higher than those working at DATCCT more than 5 years.

Table 4.12. *Examining the Differences of Factors by ATC Work Experience at DATCCT*

		Count	Mean	Standard Deviation	t	p
Factor_1	1-5 Years	121	2.53	0.68	2.347	**0.020***
	>5 Years	109	2.33	0.64		
Factor_2	1-5 Years	121	3.11	0.75	2.853	**0.005***
	>5 Years	109	2.83	0.76		
Factor_3	1-5 Years	121	2.02	0.72	1.304	0.194
	>5 Years	109	1.90	0.63		
Factor_4	1-5 Years	121	3.09	0.84	-0.216	0.829
	>5 Years	109	3.11	0.74		
Factor_5	1-5 Years	121	2.87	0.78	3.632	**0.000***
	>5 Years	109	2.52	0.66		
Factor_6	1-5 Years	121	2.83	0.94	4.443	**0.000***
	>5 Years	109	2.34	0.75		
Factor_7	1-5 Years	121	2.14	0.65	-1.519	0.130
	>5 Years	109	2.26	0.57		

t: Independent Samples t Test $p<0.05$ (statistically significant)

When Table 4.13 is examined, there is a statistically significant difference between working units in terms of "Factor_7" scores ($p<0.05$). Accordingly, "Factor_7" score of the people who work in approach control unit is significantly higher than those of area control unit and area and approach control units.

Table 4.13. *Examining the Differences of Factors by Working Unit*

		Count	Mean	Standard Deviation	F	p
Factor_1	1.Area Control Unit	172	2.42	0.68	1.857	0.158
	2.Approach Control Unit	19	2.71	0.41		
	3.Area And Approach Control	39	2.36	0.70		
Factor_2	1.Area Control Unit	172	3.01	0.77	1.407	0.247
	2.Approach Control Unit	19	3.01	0.56		
	3.Area And Approach Control	39	2.79	0.79		
Factor_3	1.Area Control Unit	172	1.95	0.71	2.180	0.115
	2.Approach Control Unit	19	2.26	0.52		
	3.Area And Approach Control	39	1.88	0.59		
Factor_4	1.Area Control Unit	172	3.13	0.78	0.939	0.393
	2.Approach Control Unit	19	2.87	0.90		
	3.Area And Approach Control	39	3.07	0.82		
Factor_5	1.Area Control Unit	172	2.74	0.77	2.713	0.068
	2.Approach Control Unit	19	2.33	0.63		
	3.Area And Approach Control	39	2.72	0.62		
Factor_6	1.Area Control Unit	172	2.61	0.93	1.071	0.344
	2.Approach Control Unit	19	2.79	0.77		
	3.Area And Approach Control	39	2.44	0.75		
Factor_7	1.Area Control Unit	172	2.12	0.60	8.648	**0.000* Difference: 2-1.3**
	2.Approach Control Unit	19	2.71	0.70		
	3.Area And Approach Control	39	2.27	0.53		

F: One Way ANOVA p<0.05 (statistically significant)

When Table 4.14 is examined, there is a statistically significant difference between the shifts in terms of "Factor_4" score ($p<0.05$). Accordingly, the "Factor_4" score of the ATCs working in rotating twelve hour shifts was significantly higher than that of the ones working in permanent day shift.

Table 4.14. *Examining the Differences of Factors by Working Shift*

		Count	**Mean**	**Standard Deviation**	**t**	**p**
Factor_1	Rotating Twelve-Hour Shift	216	2.45	0.67	1.174	0.242
	Permanent Day Shift	14	2.23	0.59		
Factor_2	Rotating Twelve-Hour Shift	216	2.98	0.76	0.600	0.549
	Permanent Day Shift	14	2.86	0.86		
Factor_3	Rotating Twelve-Hour Shift	216	1.97	0.69	0.737	0.462
	Permanent Day Shift	14	1.83	0.45		
Factor_4	Rotating Twelve-Hour Shift	216	3.13	0.78	2.300	**0.022***
	Permanent Day Shift	14	2.63	0.90		
Factor_5	Rotating Twelve-Hour Shift	216	2.72	0.76	1.012	0.312
	Permanent Day Shift	14	2.51	0.52		
Factor_6	Rotating Twelve-Hour Shift	216	2.62	0.89	1.690	0.092
	Permanent Day Shift	14	2.21	0.71		
Factor_7	Rotating Twelve-Hour Shift	216	2.20	0.63	0.400	0.689
	Permanent Day Shift	14	2.13	0.33		

t: Independent Samples t Test p<0.05 (statistically significant)

When Table 4.15 is examined, there is a statistically significant difference between "Factor_5" scores between the ATCs received OHS training and the ones who did not ($p <0.05$). Accordingly, the "Factor_5" score of the ATCs received OHS training is significantly higher than the ones who did not.

Table 4.15. *Examining the Differences of Factors by OHS Training*

		Count	Mean	Standard Deviation	t	p
Factor_1	Yes	199	2.41	0.67	-1.417	0.158
	No	31	2.59	0.58		
Factor_2	Yes	199	2.96	0.78	-0.647	0.518
	No	31	3.06	0.67		
Factor_3	Yes	199	1.94	0.70	-1.166	0.245
	No	31	2.10	0.56		
Factor_4	Yes	199	3.14	0.79	1.656	0.099
	No	31	2.88	0.80		
Factor_5	Yes	199	2.75	0.75	2.412	**0.017***
	No	31	2.41	0.61		
Factor_6	Yes	199	2.55	0.91	-1.841	0.067
	No	31	2.87	0.68		
Factor_7	Yes	199	2.17	0.58	-1.806	0.072
	No	31	2.38	0.79		

When Table 4.16 below is examined, there is a statistically significant difference between the “Factor_2”, “Factor_5” and “Factor_6” scores between the ATCs with and without knowledge about ergonomic working principles ($p<0.05$). According to this, “Factor_2”, “Factor_5” and “Factor_6” scores of those who have knowledge about ergonomic working principles are significantly higher than those who have no knowledge about ergonomic working principles.

Table 4.16. *Examining the Differences of Factors by Knowledge on Ergonomic Working Principles*

		Count	Mean	Standard Deviation	t	p
Factor_1	Yes	139	2.46	0.65	0.810	0.419
	No	91	2.39	0.68		
Factor_2	Yes	139	3.13	0.76	4.049	**0.000***
	No	91	2.73	0.70		
Factor_3	Yes	139	1.90	0.67	-1.654	0.100
	No	91	2.05	0.69		
Factor_4	Yes	139	3.16	0.83	1.338	0.182
	No	91	3.01	0.74		
Factor_5	Yes	139	2.89	0.75	4.857	**0.000***
	No	91	2.42	0.64		
Factor_6	Yes	139	2.74	0.96	3.320	**0.001***
	No	91	2.37	0.71		
Factor_7	Yes	139	2.14	0.60	-1.809	0.072
	No	91	2.29	0.63		

t: Independent Samples t Test p<0.05 (statistically significant)

When Table 4.17 below is examined, there is a statistically significant difference between the "Factor_2", "Factor_3", "Factor_5" and "Factor_7" scores between the ATCs think that their working environment is ergonomic ($p < 0.05$). Accordingly, the "Factor_2" score of those who think that their working environment is ergonomic is significantly higher than those who do not. The "Factor_3" score of those who do not think that their working environment is ergonomic is significantly higher than those who do. The "Factor_5" score of those who think that their working environment is ergonomic is significantly higher than those who do not think and who have no idea. The "Factor_7" score of those who do not think that their working environment is ergonomic is significantly higher than those who do.

Table 4.17. *Investigation of the Differences of Factors by Idea of Ergonomic Working Environment*

		Count	Mean	Standard Deviation	F	p
Factor_1	1.Yes	86	2.34	0.55	1.503	0.225
	2.No	90	2.48	0.79		
	3.No idea	54	2.51	0.61		
Factor_2	1.Yes	86	3.17	0.63	6.331	**0.002* Difference: 1-2**
	2.No	90	2.77	0.84		
	3.No idea	54	3.00	0.75		
Factor_3	1.Yes	86	1.83	0.61	3.097	**0.047* Difference: 1-2**
	2.No	90	2.09	0.75		
	3.No idea	54	1.97	0.64		
Factor_4	1.Yes	86	3.03	0.74	0.690	0.503
	2.No	90	3.11	0.85		
	3.No idea	54	3.19	0.80		
Factor_5	1.Yes	86	2.95	0.67	7.885	**0.000* Difference: 1-2.3**
	2.No	90	2.54	0.79		
	3.No idea	54	2.59	0.69		
Factor_6	1.Yes	86	2.66	0.81	0.692	0.502
	2.No	90	2.51	0.98		
	3.No idea	54	2.63	0.85		
Factor_7	1.Yes	86	2.06	0.53	3.296	**0.039* Difference: 1-2**
	2.No	90	2.28	0.62		
	3.No idea	54	2.27	0.72		

F: One Way ANOVA p<0.05 (statistically significant)

4.3. Discussions

Safety is one of the biggest concerns for all the stakeholders of today's civil aviation which has a tremendous growth rate. Aviation safety is achieved by many constituents including air traffic control, the key element. In order to maintain a safe air traffic flow, air traffic controllers play a key role due to the scope of their job. Various aspects of air traffic control job has been studied quite a lot times. The main purposes of many studies in this area are to improve efficient traffic flows, plan and coordinate the safe

operation of flights, enhance traffic predictibility and meet capacity needs. However, the human factor aspect of this profession is still in need of improvement. Taking into consideration that air traffic controllers have a highly mental-intensive profession, investigation of psychosocial risks they are exposed to becomes prominent. There are also limited amount of studies measuring health outcomes of working conditions or effects of tangible factors; but targeted improvements cannot be achieved by outcome based reactive approaches. For this reason, there is still need for spesific studies in this field, especially focusing on psychosocial conditions rather than physical conditions. In order to reach and maintain desired level of safety in air traffic control, new approaches to improvement of psychosocial conditions should be developed. By measuring psychosocial risk perceptions with a new scale specified on the characteristics of the job, this study on assessment of psychosocial risk factors among air traffic controllers is thought to contribute to the literature via inspiring further research aiming to develop predictive improvement strategies on managing psychosocial risks of the profession.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The psychosocial risk factors among air traffic controllers in DATCCT were assessed with the findings of the research. The results and findings from the research revealed that the objectives of the study were fully accomplished. The following conclusions have been reached through the results of the study:

- Assessment of the psychosocial risk factors among air traffic controllers with different ages and different experiences showed that; air traffic controllers between the ages 23 and 35, experienced air traffic control job between 1 and 9 years, and experienced working at DATCCT between 1 and 5 years have significantly more negative thoughts about the group harmony and cooperation, compared to those in the 35 plus age group, experienced air traffic control job for 10 years or more and experienced working at DATCCT between more than 5 years.

- The workload and responsibility perception also differs by age and experience. Air traffic controllers between the ages 23 and 35, experienced air traffic control job between 1 and 9 years, and experienced working at DATCCT between 1 and 5 years have significantly more positive thoughts about the workload and responsibility, compared to those in the 35 plus age group, experienced air traffic control job for 10 years or more and experienced working at DATCCT between more than 5 years.

- Group harmony and cooperation attitude depends on the gender characteristics since male air traffic controllers are found out to be more negative when compared with female air traffic controllers.

- Marital status of the controllers are found to affect group conflict and workload perceptions. Married air traffic controllers think there is less bickering, clashes and disputes between group members compared to single air traffic controllers. Also they find their workload easier to handle compared to singles.

- The air traffic controllers who received training about occupational health and safety are more tolerant about their workload and rule compliances when compared with untrained controllers. In other words, occupational health and safety training decreases the feeling of work overload and prevents breaking the rules or policies to carry out assignments.

- In terms of future expectations from the job, the air traffic controllers working in rotating twelve hour shifts are more optimistic about the future of their career in comparison to those working in permanent day shift.

- Job satisfaction is found to be depending on job experience. Air traffic controllers which experienced air traffic control job between 1 and 9 years are significantly more satisfied with their jobs compared to those experienced air traffic control job for 10 years or more.

5.2. Recommendations

- The results of the study mostly throws attention to the crucial importance of harmony, solidarity and the sense of belonging between group members. Since younger, inexperienced, male and single controllers have more negative thoughts about the group harmony and cooperation, measures should be taken to ensure and promote harmony and cooperation within the teams. Considering the fact that the air traffic control job, by its nature, is highly dependent of teamwork, this situation saddles management with a responsibility of ensuring labor peace within air traffic controllers and broadening the scope of cooperation between group members.

- Creating a family atmosphere and developing good communication between all the controllers in the control center might reinforce solidarity. It will be possible with organizational attempts that will stick to human resources policy. These improvement attempts may include social projects, seminars, interactive trainings, custom-design games and such activities for promoting indulgence, commutual trust and understanding.

- Also, feeling of work overload and bending/breaking the rules or policies to carry out assignments is another important issue in air traffic control. Air traffic controllers who are aged, experienced, single and who did not receive training about occupational health and safety feel more work overload and comply less with the rules. Work overload perception might be increasing with age and experience depending on the burden while rule compliance might be increasing with occupational health and safety training. Organizational changes should apply in order to provide justice in workload distribution, to prevent unnecessary duties on controllers.

- Compliance with the rules and policies should be supported by more comprehensive occupational trainings including the specific risks of breaking air traffic control rules. Occupational health and safety trainings that are modified to be specified on psychosocial aspects of the job should be programmed for each controller and these trainings should be adapted to orientation process in order to make sure no one starts working actively prior to receive these trainings and learn to manage psychosocial risks they are about to be exposed. Outcomes of these trainings should also be monitored and reported by regular inspections.

- Responsibility perception is one of the most constitutive factors among psychosocial risk factors of air traffic controllers. One of the most critical findings from the study shows that responsibility feeling both for co-workers and public is stronger in elderly controllers, depending on their awareness and experience on the job. In other words, the younger and inexperienced controllers have lower risk perception. Even the higher risk load of air traffic control job is a known fact, younger controllers tend to underestimate their responsibilities. Since underestimating the work related responsibilities increases the risk of incident, efforts to increase the risk perceptions of inexperienced controllers should be regularly carried out. On the other hand, overestimating the responsibilities causes increase in pressure feeling, anxiety and stress. Thus, there should be organizational arrangements to create an optimum balance between these two ends. Insufficient responsibility perception might be dealed with raising awareness through occupational trainings while excessive responsibility perception might be dealed with mind relaxing techniques.

- In terms of future expectations from the job, the air traffic controllers working in rotating twelve-hour shifts are more optimistic about the future of their career in comparison to those working in permanent day shift. This result of the study might be explained with the fact that the controllers work in shifts are managing air traffic flow,

while the controllers working in permanent day shift are doing secondary jobs. This situation prevent day-time controllers from feeling the importance and future of the actual job. Rotations should be performed among all the air traffic controllers to ensure they experience and understand all aspects of the job they are doing. Also, air traffic controllers' participation in the projects of the organizations that are forming the future of the job.

- Job satisfaction is the sum of all aspects of the job depending on employees' personal characteristics. When the backbreaking effects of the psychosocial risks of the job are considered, it is quite acceptable that more experienced controllers feel less satisfactory. An overall psychosocial improvement strategy should be adapted by management and good practices in the sector should be applied throughout the organization in order to raise job satisfaction.

For the future studies, this study can be modified with involvement of all the air traffic controllers throughout the country or can be expanded in all kinds of air traffic controllers in and around the region with the aim of promoting psychosocial health and safety of air traffic controllers and contributing aviation safety.

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APPENDIX

A. Psychosocial Risk Factors Scale

PSYCHOSOCIAL RISK FACTORS INVESTIGATION ON AIR TRAFFIC CONTROLLERS QUESTIONNAIRE FORM

We want to know about your work environment and how it affects you. This information is not available anywhere else. Your answers on the enclosed forms are needed.

DO NOT PUT YOUR NAME ON ANY OF THE FORMS PROVIDED. Your answers are to remain anonymous. The information which you provide will be combined with other answers only in statistical summaries.

Thank you for your cooperation and support.

BACKGROUND INFORMATION

1. Age:

2. Gender: ○ Female ○ Male

3. Marital status:
○ Married ○Widowed ○ Seperated ○ Divorced ○ Single (Never Married)

4. Level of education:
   ○ High school ○ Graduate ○ Post Graduate (Master/PhD)
5. I have been working as an air traffic controller for _ _ years.

6. I have been working as an air traffic controller at this airport for _ _ years.

7. The airport I am working at: ___

8. I am working at following air traffic control unit in this airport.
   a. ○ Area control unit ○ Aerodrome control unit
   b. ○ Approach control unit ○ Area and approach control unit

9. I am working as a(n): (Multiple options can be selected, fill in the appropriate cell)
   ○ Assistant ATC ○ Team Chief ○ TWR Chief ○ Lecturer
   ○ ATC ○ ACC Chief ○ OJTI
   ○ Chief ATC ○ APP Chief ○ FMP
   ○ Other (Please specify)

10. My work shift is: ○ Rotating twelve-hour shift ○ Permanent day shift

11. I have received a training in occupational health and safety.
    ○ Yes ○ No

12. I have information about ergonomic working principles.
    ○ Yes ○ No (go to 14th question) ○ No idea (go to 14th question)

13. I think my working environment is suitable for an ergonomic work.

○ Yes ○ No ○ No idea

WORKLOAD AND RESPONSIBILITY	The next few items are concerned with various aspects of your job. Please indicate how much of each aspect you have on your job by checking in the box provided.				
	Strongly Agree (5)	Moderately Agree (4)	Neither Agree nor Disagree (3)	Moderately Disagree (2)	Strongly Disagree (1)
14. I have a lot of work load.					
15. I work on unnecessary things.					
16. I receive an assignment without adequate resources and materials to execute it.					
17. I feel certain about how much authority I have.					
18. I have to bend or break a rule or policy to carry out an assignment.					
19. I receive incompatible requests from two or more people.					
20. I have a lot of responsibilities for co-workers job security					
21. I have a lot of responsibilities for the morale of co-workers					
22. I have a lot of responsibilities for the welfare and lives of other people					

CONFLICT AT WORK	Strongly Agree (5)	Moderately Agree (4)	Neither Agree nor Disagree (3)	Moderately Disagree (2)	Strongly Disagree (1)
23. There is harmony within my group.					
24. In our group, we have lots of bickering over who should do what job.					
25. There is friendliness and "we" feeling among the members of my group.					
26. There are clashes between subgroups within my group.					
27. There is cooperation between my group and other groups.					
28. There are disputes between my group and other groups.					
29. There are personality clashes between my group and other groups.					

SOCIAL SUPPORT	The next few items are concerned with various aspects of your job. Please indicate how much of each aspect you have on your job by checking in the box provided.				
	Strongly Agree (5)	Moderately Agree (4)	Neither Agree nor Disagree (3)	Moderately Disagree (2)	Strongly Disagree (1)
30. My immediate supervisor go out of his/her way to make					

my work life easier for me.					
31. Other people at work go out of their way to make my work life easier for me.					
32. It is easy to talk with my immediate supervisor.					
33. It is easy to talk with other people at work.					
34. My immediate supervisor can be relied on when things get tough at work.					
35. Other people at work can be relied on when things get tough at work.					
36. My immediate supervisor is willing to listen to my personal problems.					
37. Other people at work are willing to listen to my personal problems.					
WORKING CONDITIONS	Strongly Agree (5)	Moderately Agree (4)	Neither Agree nor Disagree (3)	Moderately Disagree (2)	Strongly Disagree (1)
38. I think my working shifts are appropriate.					
39. The amount of breaks I have between heavy work load periods is sufficient					
40. Restless nights have a bad effect on me both mentally and physically.					

41. Sometimes I feel like I'm not mentally or physically well enough to work.					
42. I think that I have got some health problems based on my job.					
43. Stress, fatigue, burden and working shifts arising from the job cause some problems in my social life.					

YOUR JOB FUTURE	The next few items are concerned with various aspects of your job. Please indicate how much of each aspect you have on your job by checking in the box provided.				
	Strongly Agree (5)	Moderately Agree (4)	Neither Agree nor Disagree (3)	Moderately Disagree (2)	Strongly Disagree (1)
44. I am certain about what my future career picture looks like.					
45. I am certain of the opportunities for promotion and advancement which will exist in the next few years.					
46. I am certain about whether my job skills will be of use and value 5 years from now.					
47. I am certain that I could support myself if I lost my job.					

JOB SATISFACTION	The next few items are concerned with various aspects of your job. Please indicate how much of each aspect you have on your job by checking in the box provided.				
	Strongly Agree (5)	Moderately Agree (4)	Neither Agree nor Disagree (3)	Moderately Disagree (2)	Strongly Disagree (1)
48. Knowing what I know now, if I had to decide all over again, I would take the same job I now have.					
49. If a friend of mine told me he/she was interested in working in a job like mine, I would recommend it.					
50. All in all, I am satisfied with my job.					