THE RELATIONSHIP BETWEEN MENTAL WORKLOAD AND FATIGUE IN EMERGENCY DEPARTMENT NURSES

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Master of Nursing (Emergency Nursing)

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APPROVAL

The Directorate of Graduate School of Health Sciences, this study has been accepted by the thesis committee in nursing program as a master of emergency nursing thesis.

Thesis Committee:

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Member: Assistant Professor Meltem Meriç

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Approval:

According to the relevant article of the Near East University Post graduated Study Education and Examination Regulation, this thesis has been approved by the above Mentioned Members of the thesis committee and the Decision of the board of Directors of the Institute.

Professor K. Hüsnü Can BAŞER
Director of Graduate Institute of Health Sciences
DECLARATION

I hereby declare that the work in this thesis about “The Relationship Between Mental Workload and Fatigue in Emergency Department Nurses” this study of my own research efforts undertaken under the supervision of Prof. Ümran Dal Yılmaz.

My great thanks to Professor Ümran Dal Yılmaz, my advisors for her knowledge and experience to help and support me during my research.

A special thanks to my committee members, Assistant Professor Meltem Meriç, Assistant Professor Gülten Sucu Dağ and Professor K. Hüsnü Can BAŞER for their invaluable feedback and support my thesis.

I am most thankful to my Wife, for without her support and encouragement, this would never have been possible.

I express my profound gratitude to my brothers and sisters for their support, constant encouragement through all my years of study and through the process of researching and writing the thesis.

Thank you as well to my colleagues and dearest friends for all your encouragement and guidance.
ABSTRACT

Introduction: Fatigue is one of the foremost vital issues in work environments which causes reduce the quality of work, increases errors and accidents. Individuals working in occupations with a high workload might have to struggle with decreased performance, memory loss, damage to the thought process, irritability, and decreased learning due to weakness and improper scheduling.

Objectives: The aim of the study is determination of the Relationship Between Mental Workload and Fatigue in Emergency Department Nurses. Workload is one of the most variables affecting fatigue.

Methods: In this cross-sectional descriptive-analytic study, the relationship between mental workload and fatigue in nurses who are working in Ble, Mergasor and Ashti General Hospital in the Emergency Department was investigated. Total 65 voluntary nurses were composed the sample of the study. Data collection tools consisted of three demographic characteristics, fatigue (CIS20R) and mental workload (NASA-TLX) questionnaires. Data were gathered utilizing a questionnaire in July 2018, after the ethical approval. Descriptive statistics, correlation coefficient and ANOVA tests were used in analysis of the data.

Results: Despite the lack of a statistically significant relationship between mental workload and fatigue, varying degrees of mental workload and fatigue among emergency department nurses were obtained.

Conclusions: Based on this study, reviewing the structure of the emergency department and focus on safeguarding the health of human resources are of great importance in order to provide the basic psychological needs related to the staff work as much as possible. In addition, the need to examine the psychological dimensions of employees at the beginning of their application in emergency departments should be considered.

Keywords: Mental Workload, Fatigue, Nurses, Emergency Department
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<thead>
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<th>Context</th>
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<tbody>
<tr>
<td>(NASA-TLX)</td>
<td>National Aeronautics and Space Administration - Task Load index</td>
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<tr>
<td>CIS20R</td>
<td>Checklist Individual Strength</td>
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<tr>
<td>BSN</td>
<td>Bachelor of Science in Nursing</td>
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<tr>
<td>ENT</td>
<td>Ear Nose &amp; Throat</td>
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<td>ED</td>
<td>Emergency Department</td>
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1. INTRODUCTION

1.1. Problem Definition

Fatigue is one of the most important issues in work environments. Fatigue is a very complex concept that includes psychological and physiological factors (Zhao, Zheng, Zhao, & Liu, 2010). As a result, instead of being considered as a one-dimensional phenomenon, it is regarded as a very complex phenomenon with many components. Central nervous system and muscles are the main targets most immediately affected by fatigue (Choi & Song, 2003).

Fatigue can be, and is, defined quite differently; it can be defined as an increasing difficulty in mental and physical activity due to inadequate sleep (Drinkwater, Lane, & Cannon, 2009). According to another definition, fatigue implies continuous complaints throughout the day due to insomnia (Riedel & Lichstein, 2000). Fatigue is a condition that lowers body's resistance and decreases interest in daily activities and work (Phillips, 2015; van der Schaaf et al., 2018).

Fatigue has two aspects: physical and psychological. Fatigue is accompanied by a reduction in the ability and motivation for doing work. In spite of the fact that fatigue may have diverse causes, it affects function and motivation quite similarly and reduces mental and physical performance. When an individual is tired, his normal behavior might change by performing a small error (Amundsen & Sagberg, 2003). On the other hand, fatigue interacts with physical, mental and emotional performance, causing significant decrease of energy and weakness (Choi & Song, 2003; Coetzee & Klopper, 2010). In general, fatigue causes blurred feelings, reduced physical activity, disrupts the balance of the nervous system and reduces work efficiency. Fatigue can also be effective in developing or exacerbating various disorders, including mental illness, cardiovascular disease, slowness of mind, weakness, memory loss, muscle aches, forgetfulness and imbalance (Choi & Song, 2003; Habibi, Parvari, Khodarahmi, Dehghan, & Hosseini, 2011).

Workload is one of the main factors affecting fatigue; workload can be defined as a charge to the operator to achieve a certain level of performance or the amount of overall work that must be done by a person or group of people at a given time interval. Workload and long working hours are the main factors in fatigue. The general concept of workload emerged of human variables and is basically related to the mental abilities of
the individual (Arellano, Mejía, Pérez, Alcaraz, & Brunette, 2012; Gore, 2018; Habibi et al., 2011). Individuals working in occupations with a high workload might have to struggle with decreased performance, memory loss, damage to the thought process, irritability, and decreased learning due to weakness and improper scheduling (DiDomenico & Nussbaum, 2011; Graham, 2015). Given the critical nature of profession and the necessity of the safety of the patients, the relationship between work-related fatigue and error is very important in individuals who work in the hospitals. Meanwhile, nurses are subject to extreme mental workload because they are always making important decisions which are in direct relationship with the life of people (Hart & Staveland, 1988; Powell, Savin, & Savva, 2012; Weissman et al., 2007).

Nursing is believed to be at the forefront of stressful hospital and medical careers (Nantsupawat, Nantsupawat, Kunaviktikul, Turale, & Poghosyan, 2016). The Canadian Association of Nurses in a 2010 study found that nurses experience significant levels of fatigue (Association, 2010). The results of Kim et al. (2014) study, which was conducted to determine the relationship between the nurses' and patients' perception of adverse events and workloads of nurses in South Korea, showed a significant relationship between nurse and patient perceptions of adverse events and nurses' workload. Nursing, especially in emergency department, is by nature a stressful profession, because it is highly complex, active, and dynamic (Kim et al., 2013). Emergency departments are difficult places to work for the following reasons: demanding working conditions, significant volumes of work and psychological stress, lack of resources, and inadequate support (Hunsaker, Chen, Maughan, & Heaston, 2015; Tao, Ellenbecker, Wang, & Li, 2015). Nurses working in these environments should, despite the time constraints and stresses of the environment, focus on the survival of the patients, as well as factors such as frequent contact with the patients, the patients' condition, the number of patients with the nurse, the presence of stressors, possible conflicts nursing managers, the lack of facilities for diagnosis and treatment, all of which might lead to more confusion (Allah et al., 2011; Dall'Ora, Griffiths, Ball, Simon, & Aiken, 2015; Roth & Moore, 2009). All of these factors have adverse effect on the nature of nursing job by complicating decision making, creativity, and problem-solving ability, all of which are fundamental aspects of patient care in the health care system (Starc, 2018). Therefore, given the criticality of the tasks of nurses in the emergency department and the need for high accuracy and
vigilance during the care of patients with special conditions and failure to conduct a study on the fatigue and longevity of nurses in the emergency department, the present researchers decided to conduct a study aimed at determining the relationship between mental workload and fatigue in emergency department nurses.

1.2. Aim of the Study

The aim of the study is determination of the relationship between mental workload and fatigue in emergency department nurses. Study questions include followings:

- What is the rate of fatigue and its dimensions among emergency department nurses?
- What is the rate of mental workload and its dimensions among emergency department nurses?
- What is the relationship between mental workload and fatigue dimensions in emergency department nurses?
- What is the difference between mental workload and demographic characteristics of emergency department nurses?
- What is the difference between fatigue and demographic characteristics of emergency department nurses?
2. GENERAL INFORMATIONS

2.1. Fatigue

Fatigue is defined as a normal and transient reaction to stress as well as emotional and physical tensions in which a person feels sadness and his/her efficiency decreases. Fatigue (asthenia and lethargy) is a mental tiredness which is distinct from myasthenia and has a gradual onset. Unlike asthenia, it could be reduced through periods of rest. It can have physical or psychological causes. Physical fatigue is defined as a temporary and transient inability of muscles to maintain optimal physical performance and it can be worse with intense physical activity (Abd-Elfattah, Abdelazeim, & Elshennawy, 2015; Hornsby, Naylor, & Bess, 2016). Mental fatigue is defined as a loss maximal cognitive performance which results from prolonged periods of cognitive activity and can cause drowsiness, lethargy, tiredness, or the lack of concentration (Marcora, Staiano, & Manning, 2009).

Medically, fatigue is a symptom, instead of a sign, since it is a subjective phenomenon which is expressed by affected individual, rather than being an objective evidence that can be detected by someone other than affected individual (Berrios, 1990; Nasiri, Rahimian, Jahanshahi, Fotoukian, & Motamed Omran Chaboki, 2016).

2.1.1. Fatigue classification

*Physical fatigue:*

Physical or muscle fatigue is a transitory muscle failure to work excellently. The onset of muscle fatigue is gradual during physical activity and it depends on the level of physical fitness and is often caused by other factors such as sleep deprivation and poor general health of the body (Abd-Elfattah et al., 2015; Wan, Qin, Wang, Sun, & Liu, 2017). Physical fatigue can heal by rest. Physical fatigue is caused by the lack of energy in muscles through reducing the efficacy of muscle neuromuscular connections or reducing the stimulation and pressure derived from CNS (Gandevia, 2001). Central part of fatigue is stimulated through the increasing the serotonin levels in CNS (J. M. Davis, Alderson, & Welsh, 2000). During motor activity, the serotonin is released in synapses of the motor neurons which cause muscle contraction (Perrier & Delgado-Lezama, 2005). As the level of motor activity goes up, the sum of released serotonin increases and overflow occurs. Serotonin binds to extra-synaptic receptors located in the axon of the primary portion of
the motor neurons, which triggers the onset of nerve impulses and inhibition of muscle contraction (Cotel, Exley, Cragg, & Perrier, 2013; Qi et al., 2019).

**Mental fatigue:**

Mental fatigue is characterized as a transitory failure to preserve subjective act. The onset of mental fatigue is gradual in any cognitive activity and it depends on the cognitive ability of individuals and as well as the other factors, for example, lack of sleep and lack of general health (Marcora et al., 2009). It has been shown that mental fatigue can cause a decrease in physical functions, drowsiness, lethargy and the lack of concentration as well. The lack of concentration occurs when the level of self-orientation would be depleted. It is also defined as lower or higher levels of consciousness. Anyway, it can be dangerous to perform tasks which require complete orientation and consciousness such as driving or important health-related tasks (Marcora et al., 2009; Mizuno et al., 2011).

2.1.2. Fatigue etiology

Fatigue is a natural reaction to physical activity or stress, although it can be a sign of a physical impairment. Psychological stress, excessive stimulation, sleep deprivation or an illness, all can be causes of fatigue (Greenberg, 2002).

2.1.3. Fatigue in nurses of emergency ward

Emergency ward nurses work in a complex environment with numerous and sometimes contradictory missions (Chen et al., 2018; Schriver, Talmadge, Chuong, & Hedges, 2003). The intensity of nursing care in this area has been increased to reduce the length of patient stay in hospital and consequently reduce costs (Lyneham, Cloughessy, & Martin, 2008; Rossetti, Gaidzinski, & Fugulin, 2013). These factors increase nurses’ workload and predispose them to negative health implications. When emergency ward nurses are under heavy workload, especially mental workload, they would not be able to work properly or if they adapt themselves to such conditions, it would have a negative effect on their personality (Lyneham et al., 2008; Mazzotta, 2015). These conditions can lead to excessive fatigue and burnout in these nurses because they are not able to resolve a conflict between the heavy workload and the provision of standard care (Lyneham et al., 2008).
2.2. Workload

It is defined as the volume of activities to be performed over a particular time period (Hendy, Liao, & Milgram, 1997). There are two types of workload: physical and mental:

2.2.1. Physical workload

It is the pressure that the worker has to overcome which its parameters are independent of his physical and mental characteristics.

2.2.2. Mental workload

The mental workload is generally made up of two components:

1. Tension or stress (derived from job responsibilities)
2. Strain or pressure (the effects of stress and tension derived from job responsibilities on the individual)

Excessive strain and stress cause a mismatch between the job responsibilities and person's capabilities. High mental workload can affect the selective attention which results in limitation or individual incompetence. Low mental workload can also be as harmful as high one for decent performance. In actual fact, the current view expresses that an optimal level of mental workload related to the best performance, is required (Trinkoff, Lipscomb, Geiger-Brown, Storr, & Brady, 2003).

2.2.3. Nursing Workload

Nursing workload can be divided into four levels:

1. Workload at the unit level
2. Workload at the job level
3. Workload at the patient level
4. Workload at the situation level

2.2.3.1. Workload at unit or ward level

The workload at the unit level is measured according to the nurse-patient ratio. The nurse-patient ratio can be used to compare units and patients' feedback on nursing staff (Carayon & Gurses, 2008). Conducted studies have given strong evidence that a high level of nursing workload at the unit level has a negative effect on patients' feedback (Mohammadi,
Mazloumi, Kazemi, & Zeraati, 2016; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002; Nishizaki et al., 2010). These studies recommend that improving the patient care depends on increasing the number of nurses in the unit, or reducing the number of patients assigned to each nurse. However, implementing the aforementioned recommendations may not be possible due to the high costs and the lack of nursing staff.

### 2.2.3.2. Workload at the job level

Considering to this classification, the workload at the job level depends on the type of nursing and its specialty (Carayon & Gurses, 2008). Miranda et al., measured the job-level workload to assess the effect of workload on depression and the nurses' performance in the ICU (Miranda, Ryan, Schaufeli, & Fidler, 2012). Previous studies have been conducted on the relation between workload at the job level and various nursing feedback such as stress (Hernata, Anggraini, & Setiawan, 2017; Madadzadeh, Barati, & AhmadiAsour, 2018) and job dissatisfaction (Gouzou, Karanikola, Lemonidou, Papathanassoglou, & Giannakopoulou, 2015). The measurement of job-level workload is appropriate to examine the levels of nursing workload with various specialties or job titles (Oates & Oates, 1996). Anyway, workload is a complicated, multifaceted conception and there are different causes in the clinical setting that may affect the nursing workload more than job title (Carayon, Gurses, Hundt, Ayoub, & Alvarado, 2005).

### 2.2.3.3. Workload at the patient level

The present categorization assumes that the major factor in determination of the nurses' workload is the patient's clinical condition (Carayon & Gurses, 2008). A number of the patient-level workload measurements have been developed based on patient-related therapeutic variables. However, recently developed studies have demonstrated that other factors such as useless and ineffective communications, may significantly affect nursing staff more than the patient's clinical conditions (Carayon & Gurses, 2008; Lachance, Douville, Dallaire, Padiha, & Gallani, 2015).

### 2.2.3.4. Workload at the situation level

In order to correct the defects in the three levels of measurement described above and complete them as well, another method of nursing workload categorization and measurement is conducted based on the workload examination in human-factors engineering and it is called the situation-level workload (Carayon & Gurses, 2008).
addition to the number of patients assigned to a nurse and the patient's clinical status, the situation-level workload can describe the workload experienced by a nurse through the design of health care micro-systems. In a relevant study, it was found that the various characteristics of the ICU micro-system affect the situation-level workload such as inappropriate physical work environment, large family requests and ineffective communications among members of the multi-specialty team (Gurses & Carayon, 2007). The effect of performance obstacles on nurses' workload would not be considered if only the unit-level and the patient-level were used to measure the nurses’ workload (Carayon & Gurses, 2008).

The situation-level workload is a multifaceted conception and states that different kind of performance inhibitors and facilitators (such as a noisy and distracting setting versus a quiet environment) affect the workload (Carayon & Gurses, 2008; Carayon et al., 2005).

2.2.4. Workload and patients' safety

The high level of nursing workload seems to be associated with the quality of patient care (Ridley, 2007) and it may lead to a decrease in patients' level of satisfaction (Mohammadi et al., 2016; Ridley, 2007). Relevant studies have indicated that the increase in nurses’ workload results in following factors and ultimately affects patients' safety.

There is no doubt that when a nurse allocates an amount of time to a variety of tasks, it will affect the nurses’ workload. High nursing workload causes nurses not to have enough time to do duties which directly influence the patient's safety (Carayon & Gurses, 2008). This high workload can affect health care decisions on performing various procedures and ultimately can cause a poor communication between the patient and the nurse (S. Davis, Kristjanson, & Blight, 2003).

Many studies have shown the relation between high nursing workload and job dissatisfaction (MacPhee, Dahinten, & Havaei, 2017; McHugh, Kutney-Lee, Cimiotti, Sloane, & Aiken, 2011). Job dissatisfaction in nurses may lead to depression, absenteeism, staff turnover, and poor job performance and potentially imperil the quality of patient care and affect the organization's efficiency (MacPhee et al., 2017; Zhou et al., 2015). Studies have shown a positive association between job satisfaction and job performance (Platis, Reklitis, & Zimeras, 2015), as well as patient’s satisfaction and patient care quality (Salem, Baddar, & AL-Mugatti, 2016).
High nursing workload can lead to anxiety and depression (Greenglass, Burke, & Moore, 2003). It is possible that the experienced stress and depression cause nurses fail to work properly and because of physical weakness, their cognitive responses may decrease and this poor performance may affect the quality of patient care as well as the patients' safety (Carayon & Gurses, 2008).

Unintentional error of described procedures (written rules, policies, guidelines, or methods) which are essential for the safe performance (Reason, Manstead, Stradling, Baxter, & Campbell, 1990). Alper et al. (2006) conducted a study on 120 nurses in three pediatric hospitals to evaluate self-reported errors in medical procedures. 8 to 30 percent of nurses reported the errors in routine situations, and 32 to 53 percent of them reported the errors in emergency situations. The most frequent medical errors had occurred in medical documentation and patient identification. The medical errors usually occur when nurses are under excessive pressure or high workload due to emergency situations. Under heavy workload, nurses may not be able to have enough time to comply with rules and guidelines for providing the safe care, especially for those rules and guidelines which require more time such as hand-washing (Carayon & Gurses, 2008). The increase in nurses' workload (MacPhee et al., 2017) and the low number of them (Gran-Moravec & Hughes, 2005) are the two main reasons which cause them not to be able to spend more time with patients as their occupational tasks necessitate (Jolma, 1990). Patients often expect more direct nursing care and it would resulting in both patients' (Aalto, Karhe, KOIVISTO, & VÄlimÄki, 2009) and nurses' dissatisfaction (Vahey, Aiken, Sloane, Clarke, & Vargas, 2004).
3. METHODOLOGY

3.1. Study Design

The research design was descriptive and correlation study.

3.2. Study Setting

The study was performed nurses who are working in Ble, Mergasor and Ashti General Hospital in the Emergency Department in Iraq.

**Ble General Hospital** located Kurdistan Region Government – Iraq Erbil Governorate, Mergasor district, Barzan Sub district, Ble village. opened at 1- January 2016 that composed of the surgical, medical, gynaecologic, orthopaedic, ophthalmic, dermatologic, ENT, radiologic, laboratory, and Emergency department. Daily patient rates above 250 patients, number of all medical staff working in general department it is a 175 but number of nurses working in Emergency department it is a 25 nurses in different level like BSN, diploma, and Secondary high school nurses, working by two shift Morning and Evening each shift for 12 hours working.

**Ashti Hospital** located Kurdistan Region Government – Iraq Erbil Governorate, Soran district, opened at 20- March 2013 that composed of the surgical, medical, gynaecologic, orthopaedic, ophthalmic, dermatologic, ENT, radiologic, laboratory, and Emergency department. Daily patient rates above 350 patients, number of all medical staff working in general department it is a 315 but number of nurses working in Emergency department it is a 20 nurses in different level like BSN, diploma, and Secondary high school nurses, working one week per month for 24 hours.

**Mergasor General Hospital** located Kurdistan Region Government – Iraq Erbil Governorate, Mergasor district. opened at 1- November 1999 that composed of the surgical, medical, gynaecologic, orthopaedic, ophthalmic, dermatologic, ENT, radiologic, laboratory, and Emergency department. Daily patient rates above 150 patients, number of all medical staff working in general department it is a 97 but number of nurses working in Emergency department it is a 20 nurses in different level like BSN, diploma, and secondary high school nurses, working by two shift morning and evening each shift for 12 hours working.
3.3. Sample Selection

All the nurses working in the emergency department were selected as samples through the census sampling method. Total 65 voluntary nurses have composed the sample of the study, because all nurses like to participate in the study.

3.4. Study Tools

The present study used three questionnaires of demographic characteristics, fatigue, and mental workload to collect required data.

3.4.1. A demographic questionnaire describes factors, including the name of the workplace, gender, and level of education.

3.4.2. CIS20R (Checklist Individual Strength questionnaire) questionnaire The Checklist Individual Strength (CIS) is a fatigue questionnaire developed by the Dutch research team of Vercoulen et al. in 1994. was used to assess fatigue. The questionnaire consists of 20 questions containing 4 factors of mental fatigue, concentration, motivation and physical activity. The "mental fatigue" factor includes 8 questions of 1, 4, 6, 9, 12, 14, 16, and 20; "concentration" factors include 5 questions of 3, 8, 11, 13 and 19; "motivation factor" includes 4 questions of 2, 5, 15 and 18; finally, the "physical activity" factor includes 3 questions of 7, 10, and 17. Each of these factors is assessed through a 6-point scale; the higher the total is, the higher the overall fatigue gets (Makowiec-Dabrowska and Koszada-Wlodarczyk, 2006).

3.4.3. NASA-TLX (National Aeronautics and Space Administration - Task Load index) workload index NASA-TLX is developed by Sandra G. Hart in 1988. was used to assess mental workload; this scale is one of the most well-known tools for assessing the mental workload from an individual perspective. NASA-TLX uses a visual scale of 0 to 100 divided into 10 units. 6 subscales of mental need, physical needs, time requirements, performance, effort and frustration are evaluated. Each subscale is defined in the questionnaire and the subjects are asked to study the definitions before answering the questions. The minimum score of each subscale is zero and the maximum score is 100, which the respondent determines, based on the score attributed to each individual subscale. The mean of subscales is reported as the amount of workload, which is a number between 0 and 100. Average scores below 50 are acceptable and scores above 50 are considered unacceptable (Hart and Staveland, 1988).
3.5. Data Collection

Data were collected by using questionnaires in nurses who are working in Ble, Mergasor and Ashti General Hospital in the Emergency Department. While the nurses on their duty with face to face by researcher in nurse’s staff room in emergency department and self-completion method. Completion the questionnaire took about 30 minutes.

3.6. Ethical Aspect

Ethical approval was obtained from the Near East University Scientific Researches and Ethics Committee (22.11.2018/678) and General Directorate of Health-Erbil in addition, the researcher also introduced himself to the subjects, explained the research purposes, and obtained their written consent while assuring them that the obtained information would be treated as strictly confidential.

3.7. Data Analysis

The collected data were analyzed using SPSS 21.0 limited version of the Statistical Package for the Social Sciences (IBM Corp.; Armonk, NY, USA). Descriptive statistics, calculation of central inclination indexes, mean and indexes of dispersion, absolute frequency and percentage, correlation coefficient, and ANOVA tests were used in the data analysis. Also, if some of the result was significant the measurement of significance is $p < 0.05$. 
4. FINDINGS

In this chapter, the findings of the study conducted to determine the relationship between mental workload and fatigue in emergency department nurses were given.

Table 4.1. Descriptive characteristics of the nurses (N=65)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (Number)</th>
<th>Percent</th>
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<tbody>
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<td>Age (Mean: 28.95)</td>
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<td>Years of working in emergency Department (Mean: 3.51)</td>
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<td></td>
</tr>
<tr>
<td>Preparatory of Nursing</td>
<td>15</td>
<td>23.1</td>
</tr>
<tr>
<td>Diploma</td>
<td>42</td>
<td>64.6</td>
</tr>
<tr>
<td>Bachelor</td>
<td>8</td>
<td>12.3</td>
</tr>
<tr>
<td>Hospital Workplace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ble General Hospital</td>
<td>25</td>
<td>38.4</td>
</tr>
<tr>
<td>Ashti General Hospital</td>
<td>20</td>
<td>30.8</td>
</tr>
<tr>
<td>Mergasur General Hospital</td>
<td>20</td>
<td>30.8</td>
</tr>
</tbody>
</table>

Descriptive characteristics of the nurses are shown in Table 4.1. The mean ages of the participants were 28.95 years. The most frequent age group was 26-30 years (67.7%). In terms of years of working in emergency Department, 50.8% of the participants had 1-3 years of working experience. In terms of gender distribution, 52.3% of the participants were male. The majority of the nurses had a diploma degree (64.6%).
Table 4.2. Mean scores of mental workload and Its dimensions among emergency department nurses (N=65)

<table>
<thead>
<tr>
<th>Mental workload and its dimensions</th>
<th>Mean ± SD (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Demand</td>
<td>60 ± 13.11</td>
</tr>
<tr>
<td>Physical Demand</td>
<td>58.84 ± 12.83</td>
</tr>
<tr>
<td>Temporal Demand</td>
<td>45 ± 16.65</td>
</tr>
<tr>
<td>Performance</td>
<td>62.69 ± 14.73</td>
</tr>
<tr>
<td>Effort</td>
<td>53.53 ± 14.29</td>
</tr>
<tr>
<td>Frustration</td>
<td>51.53 ± 18.15</td>
</tr>
<tr>
<td>Mental workload Total Score</td>
<td>55.26 ± 6.98</td>
</tr>
</tbody>
</table>

Table 4.2 shows descriptive statistics of the mental workload and its dimensions among Emergency Department Nurses. Performance score (62.69±14.73) and temporal demand score (45±16.65) obtained the highest and lowest rates. Total mental workload was estimated 55.26±6.98.

Table 4.3. Mean scores of mental workload and Its dimensions among emergency department nurses in the different hospitals (N=65)

<table>
<thead>
<tr>
<th>Mental workload and its dimensions</th>
<th>Ble General Hospital Mean ± SD (min)</th>
<th>Ashti General Hospital Mean ± SD (min)</th>
<th>Mergasor General Hospital Mean ± SD (min)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Demand</td>
<td>56 ± 13.07</td>
<td>56.25 ± 11.10</td>
<td>68.75 ± 11.10</td>
<td>0.001</td>
</tr>
<tr>
<td>Physical Demand</td>
<td>61 ± 14.57</td>
<td>55 ± 10.25</td>
<td>60 ± 12.56</td>
<td>0.268</td>
</tr>
<tr>
<td>Temporal Demand</td>
<td>44 ± 14.93</td>
<td>51.25 ± 15.12</td>
<td>40 ± 18.84</td>
<td>0.094</td>
</tr>
<tr>
<td>Performance</td>
<td>63 ± 16.32</td>
<td>57.5 ± 14.28</td>
<td>67.5 ± 11.75</td>
<td>0.098</td>
</tr>
<tr>
<td>Effort</td>
<td>53 ± 15</td>
<td>56.25 ± 13.75</td>
<td>51.5 ± 14.24</td>
<td>0.567</td>
</tr>
<tr>
<td>Frustration</td>
<td>50 ± 17.67</td>
<td>50 ± 21.45</td>
<td>55 ± 15.38</td>
<td>0.599</td>
</tr>
<tr>
<td>Total Score</td>
<td>54.5 ± 8.23</td>
<td>54.37 ± 5.81</td>
<td>57.12 ± 6.30</td>
<td>0.366</td>
</tr>
</tbody>
</table>

In mean scores of mental workload and its dimensions, regarding hospital workplace, ANOVA test showed a significant statistical difference in the mean scores of Mental Demand dimension.
Table 4.4. Mean scores of CIS and Its dimensions among emergency department nurses (N=65)

<table>
<thead>
<tr>
<th>CIS and its dimensions</th>
<th>Mean ± SD (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS-Subjective feeling of fatigue</td>
<td>23.41 ± 12.27</td>
</tr>
<tr>
<td>CIS-Reduction of Concentration</td>
<td>15.41 ± 5.24</td>
</tr>
<tr>
<td>CIS-Reduction of Motivation</td>
<td>7.04 ± 4.38</td>
</tr>
<tr>
<td>CIS-Reduction of Physical activity</td>
<td>7.89 ± 5.39</td>
</tr>
<tr>
<td>CIS Total Score</td>
<td>53.79 ± 18.42</td>
</tr>
</tbody>
</table>

Table 4.4 shows descriptive statistics of the fatigue and its dimensions among Emergency Department Nurses. Subjective feeling of fatigue score (23.41±12.27) and Reduction of Motivation score (7.04±4.38) obtained the highest and lowest rates. Total fatigue was estimated 53.79±18.42.

Table 4.5. Mean scores of CIS and Its dimensions among emergency department nurses in the different hospitals (N=65)

<table>
<thead>
<tr>
<th></th>
<th>Ble General Hospital Mean ± SD (min)</th>
<th>Ashti General Hospital Mean ± SD (min)</th>
<th>Mergasor General Hospital Mean ± SD (min)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS-Subjective feeling of fatigue</td>
<td>20.96 ± 11.83</td>
<td>28.10 ± 12.19</td>
<td>2.80 ± 12.17</td>
<td>0.118</td>
</tr>
<tr>
<td>CIS-Reduction of Concentration</td>
<td>13.60 ± 6.40</td>
<td>16.70 ± 4.95</td>
<td>16.40 ± 3.84</td>
<td>0.084</td>
</tr>
<tr>
<td>CIS-Reduction of Motivation</td>
<td>7.84 ± 4.86</td>
<td>6.70 ± 4.95</td>
<td>6.40 ± 3.01</td>
<td>0.510</td>
</tr>
<tr>
<td>CIS-Reduction of Physical activity</td>
<td>8.04 ± 6.16</td>
<td>6.90 ± 4.47</td>
<td>8.70 ± 5.32</td>
<td>0.572</td>
</tr>
<tr>
<td>CIS Total Score</td>
<td>50.44 ± 19.83</td>
<td>58.40 ± 18.09</td>
<td>53.30 ± 16.79</td>
<td>0.357</td>
</tr>
</tbody>
</table>

We see that in Table 4.5; In mean scores of fatigue and its dimensions, regarding hospital workplace, showed a no significant difference in any of the variables.
Table 4.6. The relationship between mental workload and fatigue dimensions in emergency department nurses (N=65)

<table>
<thead>
<tr>
<th>Mental workload</th>
<th>Subjective feeling of fatigue</th>
<th>Reduction of Concentration</th>
<th>Reduction of Motivation</th>
<th>Reduction of Physical activity</th>
<th>CIS Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p</td>
<td>r</td>
<td>p</td>
<td>r</td>
<td>p</td>
</tr>
<tr>
<td></td>
<td>0.82</td>
<td>-0.87</td>
<td>0.317</td>
<td>0.12</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Spearman correlation coefficient

We see that in Table 4.6; Based on the Spearman correlation coefficient, there was no significant relationship between mental workload and fatigue dimensions in emergency department nurses.

Table 4.7. The relationship between mental workload and demographic characteristics of emergency department nurses (N=65)

<table>
<thead>
<tr>
<th>Mental workload</th>
<th>Pearson's chi-squared test</th>
<th>Eta test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
<td>Years of working in emergency Department</td>
</tr>
<tr>
<td></td>
<td>r</td>
<td>p</td>
</tr>
<tr>
<td></td>
<td>-0.13</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Based on the above table 4.7, Eta's statistical index showed a very weak correlation between the variables of gender, level of education and hospital workplace, with mean scores of mental workload among Emergency Department Nurses. Also, based on Pearson correlation test, there was no statistically significant correlation between age and years of working in emergency Department with mean scores of mental workloads.
Table 4.8. The relationship between fatigue and demographic characteristics of emergency department nurses (N=65)

<table>
<thead>
<tr>
<th>Mental workload</th>
<th>Pearson's chi-squared test</th>
<th>Eta test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
<td>Years of working in emergency Department</td>
</tr>
<tr>
<td></td>
<td>r</td>
<td>p</td>
</tr>
<tr>
<td></td>
<td>0.07</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Based on the above table, showed a very weak correlation between the variables of gender, level of education and hospital workplace, with mean scores of fatigue among Emergency Department Nurses. Also, based on Pearson correlation test, there was no statistically significant correlation between age and years of working in emergency Department with mean scores of Fatigues.
5. DISCUSSION

The focus of this study was determination of the relationship between mental workload and fatigue in emergency department nurses. The study was conducted on 65 nurses with vary gender, level of education and hospital workplace. Regarding gender, the study revealed that 52.3% of the participants were male. The majority of the nurses had a diploma degree (64.6%) (Table 4.1). In relation to the dominance of male sex in the samples of this study, it can be stated that the reason may be related to the nature of the emergency department and the need for more male staff in these units.

In relation to the first question of research (What is the rate of fatigue and its dimensions among emergency department nurses?), the results of this study showed that total fatigue was estimated 53.79±18.42. Also in the present study, subjective feeling of fatigue score (23.41±12.27) was the highest rates. (Table 3.1)

According to the CSI questionnaire, the overall fatigue scores is in the range of 20-120. According to this study, it is concluded that the mean of overall fatigue scores is in the medium range. These results are consistent with the results of Motamedzade et al. Study. In their study, the total mean of fatigue score was 58.40 ± 11.90. Among fatigue dimensions, mental fatigue had the highest mean in comparison with other dimensions (Motamedzade et al., 2017). However, in Teixeira et al. Study, 42% of the participants had a severe fatigue (Teixeira, Ribeiro, Fonseca, & Carvalho, 2013). And in the study of Guntupalli et al., 20.8% had a severe fatigue as well (Guntupalli, Wachtel, Mallampalli, & Surani, 2014).

Conducted studies have mentioned many reasons for fatigue in nurses, including severe illness, patients' death, high workload, role ambiguity, frequent exposure to stressful situations and occupational stress, organizational position such as authority, social support, autonomy and workload (Hooper, Craig, Janvrin, Wetsel, & Reimels, 2010; Hunsaker et al., 2015; Motamedzade et al., 2017; Myhren, Ekeberg, & Stokland, 2013).

Several studies have indicated that factors, including shift work and long-term work, are effective in nurses’ subjective feeling of fatigue (Caruso, 2014; Kagamiyama & Yano, 2018). Results of Kagamiyama and et al study revealed rotating shift work one of the important factors in a high degree of subjective fatigue among nurses. Because after a
night-shift, have a disrupted sleep rhythm can cause the subjective feeling of fatigue of nurses (Kagamiyama & Yano, 2018).

Effects of long working hours is an important issue for the researchers involved in the ergonomics studies from past few decades (Bae, 2013; Caruso, 2014). Nursing shortages lead to increased workload. Bae's findings showed that 15 percent of nurses in american hospitals work more than 40 hours a week (Bae, 2013). Studies have shown that there is a relationship between long hours of work and cumulative fatigue (Bannai & Tamakoshi, 2014; Park, Kim, Chung, & Hisanaga, 2001). long hours of work had increased the exposure to psychological and physical demands and may induce fatigue and stress in affected workers (Salve, 2017). The results of the study showed that the average percentage of feeling of subjective fatigue “before going to work” increased with the increase in length of weekly working hours (Park et al., 2001). Therefore, improving each of these factors can help reduce pressure and mental fatigue of nurses. Park and colleagues showed that the average percentage of mental fatigue score "before going to work" increases with an increase in weekly working hours and significant changes One of the factors affecting the behavior and performance of individuals in the workplace, and thus affecting their efficiency, is the mental workload. The mental workload is the amount of effort that the mind makes while discharging duty. Activities that require concentration and control measures and speed of action usually increase the mental and physical load significantly in those who do them (Hoonakker et al., 2011).

If people were able to do all the works that are described as their job description quickly, correctly, safely and with just little effort and through using existing resources, the concept of workload would not be of considerable importance, although something else happens in reality because of systemic problems, inadequate education etc. Nowadays, the intense competition for scarce resources in the health system poses a quantitative and qualitative measurement of the nurses' workload as a need (Cain, 2007; Hart & Staveland, 1988). In hospital Emergency department, the staff especially nurses bear the burden of high workload due to the fact that it is frontline department in hospital and faces with the cases that often has severe and acute medical conditions. . High workload and urgent patient care have a significant effect on the nurses' proficiency

In relation to the second question of research (What is the rate of mental workload and its dimensions among emergency department nurses?), the results of the present study showed
that the performance score (62.69±14.73) and mental demand score (60±13.11) were higher rates than others dimensions. Total mental workload was estimated 55.26±6.98. (Table 4.2)

High performance pressure in comparison with the other dimensions of workload in the current study indicates that the emergency department nurses are not satisfied with their performance in carrying out the assigned tasks along the line with the determined purpose for them. The results of previous studies have shown that solutions such as the appropriate association between nursing managers and nursing staff could be effective in nurses' performance and their efficiency (Rouhi, Hosseini, Rahmani Anaraki, Mollaie, & Nasiri, 2013; van den Oetelaar, van Stel, van Rhenen, Stellato, & Grolman, 2016). In the present study, the high mental stress also indicates the severity, complexity, and the need to have a great accuracy in performing the assigned tasks in the emergency department. In Levin et al. Study, it was found that the doctors' and nurses' highest workload in the emergency department was related to mental or psychological stress (Levin et al., 2006).

In relation to the third question of research (What is the relationship between mental workload and fatigue dimensions in emergency department nurses?), the results of the present study showed no significant relationship between mental workload and fatigue dimensions in emergency department nurses. (Table 4.6)

In the present study, there is no correlation between the level of fatigue and its dimensions with mental workload in nurses through using the Spearman's rank correlation coefficient which was not consistent with the results of VanBogaert et al. (Van Bogaert, Clarke, Willems, & Mondelaers, 2013) and Green glass et al. studies (Greenglass, Burke, & Fiksenbaum, 2001). In these studies, it has been determined that workload as a major component of the health service plays a decisive role in undesirable implications such as emotional exhaustion, depersonalization, and burnout.

Fan and Smith, in their study declared that workload is one of several predictors of fatigue (Fan & Smith, 2017). Based on finding of a study, mental workload is associated with all the dimensions of fatigue including mental and physical ones (Hassanzadeh-Rangi, Khosravi, Sarami, & Jafari, 2017). So it can be said that, high and low workloads were associated with fatigue.
In the present study, the lack of significant correlation between the level of fatigue and mental workload among emergency department nurses, may be due to the difference in measurement instruments, especially the fatigue measurement instrument.

In this study, specific fatigue tool was used for data gathering that is different from the other study tool. So this matter could partly explain the differences in the results of two studies.

Although it should be mentioned that in Barbosa et al. study, a significant correlation was not found between these two variables among doctors (Barbosa, Leão, Tavares, & Santos, 2012). Moreover, in Bakhshi et al. study, there was no significant association between mental workload and fatigue among nurses (Bakhshi, Mazloumi, & Hoseini).

In relation to the fourth and fifth questions of the research (What is the relationship between mental workload and fatigue with demographic characteristics of emergency department nurse), the results of the present study showed that very weak correlation between the variables of gender, level of education and hospital workplace, with mean scores of mental workload and fatigue among Emergency Department Nurses. (Table 4.7, Table 4.8)

In the current study, there was also no statistically significant relation between the nurses of the emergency department of different medical education centers in the level of fatigue and its dimensions and the point which requires to be considered was that there was a statistically significant relation between the dimension of mental demand in assessing the mental workload of different hospitals' nurses. The highest rate was related to Mergasor hospital with a mean score of 75.78 ± 11.11 which was significantly higher than the other two hospitals. (Table 4.3)

The reason for this results could be traced back to differences in department management policies, high numbers of patients, lack of personnel and their level of tolerance and resilience. In total mean and other dimensions of mental workload, there was no statistically significant relation between the nurses of department 3 of the considered hospital.
6. CONCLUSION

In the present study, despite the lack of a statistically significant relation between the mental workload and fatigue, different degrees of mental workload and fatigue were found among the nurses of the emergency department. Based on the existing studies, these issues can challenge the nurses' satisfaction and their performance and consequently affect the implication of nursing process or in other word the provision of safe care for patients negatively. Therefore, it can be mentioned that in reviewing the structure of the emergency department and focus on safeguarding the health of human resources are of great importance in order to provide the basic psychological needs related to the staff work as much as possible. In addition, the need to examine the psychological dimensions of employees at the beginning of their application in emergency departments should be considered.

7. RESULTS AND RECOMMENDATIONS

7.1. Results

The main findings of the study that was performed with the aim of determination of the relationship between mental workload and fatigue in emergency department nurses were listed as followings:

In terms of gender distribution, 52.3% of the participants were male. The majority of the nurses had a diploma degree (64.6%) (Table 4.1).

Total mental workload among Emergency Department Nurses was estimated 55.26±6.98. Performance score (62.69±14.73) and temporal demand score (45±16.65) obtained the highest and lowest rates (Table 4.2).

Regarding to hospital workplace, showed a significant statistical difference in the mean scores of Mental Demand dimension among Emergency Department Nurses. Table (4.3).

Total fatigue workload among Emergency Department Nurses was estimated 53.79±18.42. Subjective feeling of fatigue score (23.41±12.27) and Reduction of Motivation score (7.04±4.38) obtained the highest and lowest rates (Table 4.4).
Regarding to hospital workplace, showed no significant statistical difference in the mean scores of fatigue and its dimensions among Emergency Department Nurses Table (4.5).

There was no statistically significant relationship between mental workload and fatigue dimensions in emergency department nurses (p> 0.05), (Table 4.6).

Eta's statistical index showed a very weak correlation between the variables of gender, level of education and hospital workplace, with mean scores of mental workload and fatigue among Emergency Department Nurses (Table 4.7, Table 4.8).

7.2. **Recommendations**

Based on the results of the study following recommendations were made;

1. It is suggested that more studies be conducted with a larger sample size in order to generalize the data to the whole society.
2. It is suggested that future studies investigate the practical experiences of nurses in the emergency department about the factors affecting the level of mental workload or fatigue.
3. Implement comprehensive, systematic and continuous educating programs to increase the level of tolerance and resilience of emergency department nurses.
4. It is recommended to increase the number of nurses in emergency department.
8. REFERENCES


Bakhshi, E., Mazloumi, A., & Hoseini, S. M. Relationship Between Mental Fatigue and Mental Workload Among Nurses. *Zahedan Journal of Research in Medical Sciences, 21*(1).


# APPENDIX

**Appendix 1. CIS20R Checklist Individual Strengths University Hospital Nijimegen Department of Medical Psychology (Kurdish Version)**

<table>
<thead>
<tr>
<th>Form (A) No.</th>
<th>Gender: Male [ ] Female [ ]</th>
<th>Level of Educations: 1 2 3 4 5</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>The Relationship between Mental Workload and Fatigue in Emergency Department Nurses</th>
</tr>
</thead>
<tbody>
<tr>
<td>لەم فۆرمە ۰یەست پرساڵەر لە خۆ دەگێت کە نامانج لەیان کەشیشە وەکو هەستییە کە بۆت دۆست بۆوه لە ماومی دۆو هەفتەی راپزەودا بۆ نەوەبەرەن.</td>
</tr>
<tr>
<td>من هەستی لە ناسەوەدەیە دەکەیم</td>
</tr>
<tr>
<td>نمگەڕییەوەیەوە لەم پرساڵەر دەرێست نیە بە هێج شێوەیەکان، نوا هەستەیەیە لە (چوارگۆشەیەیە) لاوە وەی دەبێت بەم شێوەیە خوارۆ.</td>
</tr>
<tr>
<td>نەخۆش، لەمەرەست نیە</td>
</tr>
<tr>
<td>بەنایە لەمەرەست</td>
</tr>
<tr>
<td>من هەستی لە ناسەوەدەیە دەکەیم</td>
</tr>
<tr>
<td>نمگەڕییەوەیەوە لەم پرساڵەر دەرێست نیە بە هێج شێوەیەکان، نوا هەستەیەیە لە (چوارگۆشەیەیە) لاوە وەی دەبێت بەم شێوەیە خوارۆ.</td>
</tr>
<tr>
<td>نەخۆش، لەمەرەست نیە</td>
</tr>
<tr>
<td>بەنایە لەمەرەست</td>
</tr>
<tr>
<td>من هەستی لە ناسەوەدەیە دەکەیەم</td>
</tr>
</tbody>
</table>

| نمگەڕییەوەیەوە لەم پرساڵەر دەرێست نیە بە هێج شێوەیەکان، نوا هەستەیەیە لە (چوارگۆشەیەیە) لاوە وەی دەبێت بەم شێوەیە خوارۆ. |
| نەخۆش، لەمەرەست نیە | |
| بەنایە لەمەرەست | |

| هێج پرەسەرکە بە بێ وەلەم مەهەڵەرە، وە تنها ڕێکەوەیەیە نییە بە چوارگۆشەکەدا |
| نەخۆش، لەمەرەست نیە | |
| بەنایە لەمەرەست | |

<p>| 1. من مەندووکر |
| 2. هەست دەکەیم زۆر چالاکیم |
| 3. بێڕکێتەوەیە بەندەوەیە دەوەی |
| 4. هەست دەکەیم لە زۆویەی چەستەمیەکە تەواوە مەندووکر و شەکرەکەم |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 5 | نام‌پویی همگون کاریکی باشم همه‌یه
| 6 | هم‌ست دکمک ساغ و تندیورستم
| 7 | روزکه کاری زور لنجار دمدم
| 8 | دموتاون به وری و به باشی نمو کاری دموتاون لنجاری بدم
| 9 | هم‌ست به بین تاقونی دکمک
| 10 | روزکه کاری زور لنجار نادم
| 11 | دموتاون به باشی سیر بکمشهو
| 12 | هم‌ست به ماندوبی ناکم
| 13 | ناتوانم به باشی تیزمان (ترکیز) بکمشهو
| 14 | لوروی دکمکیمهمه دم‌کم من باش نیم
| 15 | من نباتی زورم همیه
| 16 | زور زوج ماندوب دم‌بی
| 17 | بهره‌همی کم‌همه همیه
| 18 | ناروی هیچ کاریکم نیه
| 19 | دم‌بی الگو زوج دم‌بی
| 20 | لآ روی دکمکیمهمه دم‌کم شیوه‌یمک روز و پیکم همیه
Appendix 2. **CIS20R** Checklist Individual Strengths University Hospital Nijmegen Department of Medical Psychology (English Version)

***** CIS20R *****

Checklist Individual Strength
University Hospital Nijmegen
Department of Medical Psychology

**Instruction:**

*On the next page you find 20 statements. With these statements we wish to get an impression of how you have felt during the past two weeks. For example:*

*I feel relaxed*

*If you feel that this statement is not true at all, place a cross in the right box; like this:*

I feel relaxed  yes, that is true  X

*If you feel that this statement is not true at all, place a cross in the right box; like this:*

I feel relaxed  yes, that is true  X

*If you feel that this statement is not “yes, that is true”, but also not “no, that is not true”, place a cross in the box that is most in accordance with how you have felt.*

For example, if you feel relaxed, but not very relaxed, place a cross in one of the boxes close to “yes, that is true”: like this:

I feel relaxed  yes, that is true  X

Do not skip any statement and place only one cross for each statement.

1. I feel tired  yes, that is true

2. I feel very active  yes, that is true

3. Thinking requires effort  yes, that is true
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>Physically I feel exhausted</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I feel like doing all kinds of nice things</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I feel fit</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I do quite a lot within a day</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>When I am doing something, I can concentrate quite well</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>I feel weak</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>I don't do much during the day</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>I can concentrate well</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>I feel rested</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>I have trouble concentrating</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Physically I feel I am in a bad condition</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>I am full of plans</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>I get tired very quickly</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>I have a low output</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>I feel no desire to do anything</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>My thoughts easily wander</td>
<td>yes, that is true</td>
</tr>
<tr>
<td></td>
<td>no, that is not true</td>
<td></td>
</tr>
</tbody>
</table>
20. Physically I feel in a good shape       yes, that is true

**SCORING CIS20R**

For the items: 2, 5, 6, 7, 8, 11, 12, 15, 20 is the scoring as follows:

<table>
<thead>
<tr>
<th>yes, that is true</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>no, that is not true</td>
<td></td>
</tr>
</tbody>
</table>

For the items: 1, 3, 4, 9, 10, 13, 14, 16, 17, 18, 19 is the scoring as follows:

<table>
<thead>
<tr>
<th>yes, that is true</th>
<th>7 6 5 4 3 2 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>no, that is not true</td>
<td></td>
</tr>
</tbody>
</table>

Subsequently the four subscales are calculated by summing the respective items:

- **subscale 1: Subjective feeling of fatigue**
  - items 1, 4, 6, 9, 12, 14, 16, 20

- **subscale 2: Concentration**
  - items 3, 8, 11, 13, 19

- **subscale 3: Motivation**
  - items 2, 5, 15, 18

- **subscale 4: Physical activity**
  - items 7, 10, 17

\
### Appendix 3. NASA-TLX (National Aeronautics and Space Administration - Task Load index) (Kurdish Version)

<table>
<thead>
<tr>
<th>Task Load Index (TLX)</th>
<th>Description</th>
</tr>
</thead>
</table>
| Mental | نژم
| Physical | مام ناوند
| Temporal | زیاد بعزر
| Performance | داواکاری چسته
| Effort | زیاد بعزر
| Satisfication | داواکاری کاتین
| Frustration | زیاد بعزر
| Demands | مام ناوند
| Resources | داواکاری بوضوو
| Skill | نژم
| Stress | مام ناوند
| Pressure | زیاد بعزر
| Team | مام ناوند
| Coordination | زیاد بعزر
| Coordination | مام ناوند
| Coordination | زیاد بعزر
| Coordination | مام ناوند
| Coordination | زیاد بعزر
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| Coordination | مام ناوند
| Coordination | زیاد بعزر
| Coordination | مام ناونن
Appendix 4. NASA-TLX (National Aeronautics and Space Administration - Task Load index) (English Version)

Figure 8.6

**NASA Task Load Index**

Hart and Staveland's NASA Task Load Index (TLX) method assesses work load on five 7-point scales. Increments of high, medium and low estimates for each point result in 21 gradations on the scales.

<table>
<thead>
<tr>
<th>Name</th>
<th>Task</th>
<th>Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Mental Demand</th>
<th>How mentally demanding was the task?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Demand</th>
<th>How physically demanding was the task?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temporal Demand</th>
<th>How hurried or rushed was the pace of the task?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance</th>
<th>How successful were you in accomplishing what you were asked to do?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfect</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effort</th>
<th>How hard did you have to work to accomplish your level of performance?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frustration</th>
<th>How insecure, discouraged, irritated, stressed, and annoyed were you?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5. Ethical Approval Near East Institutional Reviews Board (IRB)
Appendix 6. Allowed Letter from NEU to General directorate of Health - Erbil

Ref No: HF-1259/2018
12. November, 2018

General Directorate of Health – Erbil

Dear Director;

Your citizen Kalamala Ibrahim Salih is master degree student in Near East University Faculty of Nursing. He wanted to study about “The Relationship Between Mental Workload and Fatigue in Emergency Department Nurses”. We accepted his proposal.

He wanted to study of your three different hospitals. If you let him to study he will make a research with nurses of Ble, Mergasur and Ashti General Hospitals in the Emergency Department.

I respectfully give the necessary permissions to Kalamala Ibrahim Salih.

Best wishes and sincerely yours.

Assoc. Prof. Ünver Dal Yılmaz
Vice Dean, Near East University Faculty of Nursing
Appendix 7. Permission Letter from General directorate of Health - Erbil to NEU

To whom it may concern

Permission letter

This letter is issued in support of Khalamala Ibrahim Salih who is a master student from Near East University who has been granted permission to collect data and information in Bile, Mergasur, and Ashti General hospitals for his research project about Relationship Between Mental Workload and Fatigue in Emergency Department Nurses.

With our regards.

Dr. Saman H. Barzangy
Director General
DOH - Erbil

Copy to:
✓ General Directors Office \ for your information with respect.
✓ Scientific Research Partition.

Kurdistan Region – Iraq Erbil – Barzani Namr Q.
E-Mail: info@dohlawler.com Website: www.dohlawler.org Mobil No. 00964 750 156 1162
Appendix 8. Allowed Letter from General directorate of Health - Erbil to Ble, Mergasur and Ashti General Hospital
Informed Consent Form

Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

Participant's signature ................................. Date ....../....../ ...........

Investigator's signature ................................. Date ....../....../ ...........