



UNIVERSITI PUTRA MALAYSIA

***COMPARING DIFFERENCES BETWEEN PSYCHOLOGICAL DISTRESS
AND PHYSIOLOGICAL MARKERS IN FIRST DIVISION FOOTBALL
PLAYERS***

FARAH LAYTH NAJI

FPP 2018 16



**COMPARING DIFFERENCES BETWEEN PSYCHOLOGICAL DISTRESS
AND PHYSIOLOGICAL MARKERS IN FIRST DIVISION FOOTBALL
PLAYERS**

By

FARAH LAYTH NAJI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfillment of the Requirements for the Degree of Master of Science**

November 2017

COPYRIGHT

All material contained within the thesis, including without limitation text, logos, icons, photographs, and all other artwork, is copyright material of Universiti Putra Malaysia unless otherwise stated. Use may be made of any material contained within the thesis for non-commercial purposes from the copyright holder. Commercial use of material may only be made with the express, prior, written permission of Universiti Putra Malaysia.

Copyright © Universiti Putra Malaysia



DEDICATION

To

My grandma that I wish she was here to see me graduated

My parents Dr. Layth Naji & Dr. Shawoadh Alyasiri,

My beloved brother Ammar

The person who encouraged me most and pushed me to finish the study Mohammed

Faiz

For their endless love support and encouragement

My friends and all the people in my life who touch my heart,

I dedicate this thesis.



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

**COMPARING DIFFERENCES BETWEEN PSYCHOLOGICAL DISTRESS
AND PHYSIOLOGICAL MARKERS IN FIRST DIVISION FOOTBALL
PLAYERS**

By

FARAH LAYTH NAJI

November 2017

Chairman : Tengku Fadilah Tengku Kamalden, PhD
Faculty : Educational Studies

This study aimed to determine the level of stress as measured through different stress measurement methods (DASS questionnaire, SIgA, pulse rate and oxygen saturation). The highest scores for depression, anxiety, stress, pulse rate was before the competition (M=8.365, SD=2.733), (M=8.689, SD=3.962), (M=10.068, SD=3.094), (M=63.27, SD=5.008) respectively. While for salivary IgA and oxygen saturation, the highest score was at resting time (M=112.147, SD=14.431), (M=98.3, SD=1.893) respectively. Descriptive method was used for data collection. Participants were 74 football players of all the first division clubs in Karbala, Iraq, aged between 18-22 years old.

Depression, anxiety and stress were measured at three different time points (resting time, before the training, before the competition), while salivary IgA, pulse rate, and oxygen saturation measurement were measured through five different time points (resting time, before the training, after the training, before the competition, after the competition). Comparison of variables across time points using a one-way repeated measures ANOVA was significant for all variables except depression (depression: $p=0.108$, anxiety: $p=0.018$, stress: $p=0.008$, salivary IgA: $p=0.001$, pulse rate: $p=0.001$, oxygen saturation: $p=0.001$). It can be concluded that the combination of psychological distress and physiological markers can provide accurate measurements of stress.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**PERBANDINGAN PERBEZAAN ANTARA KEMURUNGAN PSIKOLOGI
DAN PENANDA FISILOGI PADA PEMAIN BOLA SEPAK BAHAGIAN
PERTAMA**

Oleh

FARAH LAYTH NAJI

November 2017

Pengerusi : Tengku Fadilah Tengku Kamalden, PhD
Fakulti : Pengajian Pendidikan

Kajian ini bertujuan untuk menentukan tahap stres yang diukur menggunakan kaedah pengukuran stres yang berbeza (soal selidik DASS, SIgA, kadar nadi dan oksigen tepu). Skor tertinggi untuk kemurungan, kebimbangan, stres, kadar nadi adalah sebelum pertandingan (M=8.365, SD=2.733), (M=8.689, SD=3.962), (M=10.068, SD=3.094), (M=63.27, SD=5.008) masing-masing. Sementara untuk salivary Iga dan oksigen tepu, skor tertinggi adalah semasa waktu rehat (M=112.147, SD=14.431), (M=98.3, SD=1.893) masing-masing. Kaedah diskriptif telah digunakan untuk pengumpulan data. Peserta adalah 74 orang pemain bola sepak dalam kelab bahagian pertama di Karbala, Iraq, berumur diantara 18 – 22 tahun.

Kemurungan, rasa bimbang dan stres diukur pada tiga masa yang berbeza (waktu rehat, sebelum latihan, sebelum pertandingan), sementara salivary Iga, kadar nadi dan oksigen tepu diukur melalui lima masa yang berbeza (waktu rehat, sebelum latihan, selepas latihan, sebelum pertandingan, selepas pertandingan). Perbandingan pembolehubah merentasi lima titik masa menggunakan pengukuran berulang satu-hala ANOVA adalah signifikan untuk semua pembolehubah kecuali kemurungan (kemurungan:p=0.108, kebimbangan: p=0.018, stres:p=0.008, salivary Iga:p=0.001, kadar nadi:p=0.001, oksigen tepu:p=0.001). Dapat disimpulkan bahawa kombinasi kedua-dua kemurungan psikologi dan penanda fisiologi dapat memberikan pengukuran stres yang tepat.

ACKNOWLEDGEMENTS

Foremost, I am highly grateful to God for His blessing that continue to flow into my life, and because of You, I made this through against all odds. Firstly, I would like to express my wholehearted thanks to my family for their generous support they provided me throughout my entire life and particularly through the process of pursuing the master's degree. Because of their unconditional love and prayers, I have the chance to complete this thesis. I extend my grateful to the people, who worked hard with me from the beginning until the completion of the present research my parents Dr. Layth Naji and Dr. Shawoadh Alyasiri, Mohammed Faiz, Dr. Soh Kim Geok, Dr. Mahmoud Danaee, Dr. Hassan Al-Saadi, Dr. Laith Abdalelah Kamel, My uncle Haider Alyasiri, Ali Hassan, and to my supervisor Dr. Tengku Fadilah Tengku Kamalden and my co-supervisor Dr. Saidon Bin Amri.

Thank you to all of those who have helped listened and encouraged me throughout this study. My sincere thanks to all members of Karbala Football Clubs and the coaches of the teams, both staff and players, whose continuous support have made this thesis possible.

I would like to thank all of the participants in the study: university professors, coaches, football players and Local Education Authorities, for the time and help given throughout. Without their participation, this research would not have been possible. Finally, I thank my family, without whom this thesis would not have been started or completed, your encouragement and support has never faltered; thank you.

I certify that a Thesis Examination Committee has met on 14 November 2017 to conduct the final examination of Farah Layth Naji on her thesis entitled "Comparing Differences between Psychological Distress and Physiological Markers in First Division Football Players" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

Soh Kim Geok, PhD

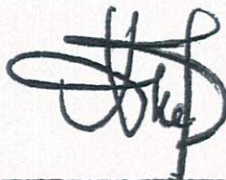
Associate Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Chairman)

Kok Lian Yee, PhD

Senior Lecturer
Faculty of Educational Studies
Universiti Putra Malaysia
(Internal Examiner)

D.Maryama Ag. Daud, PhD

Associate Professor
Universiti Malaysia Sabah
Malaysia
(External Examiner)



NOR AINI AB. SHUKOR, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 28 March 2018

This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

Tengku Fadilah binti Tengku Kamalden, PhD

Senior Lecturer
Faculty of Educational Studies
Universiti Putra Malaysia
(Chairman)

Saidon bin Amri, PhD

Senior Lecturer
Faculty of Educational Studies
Universiti Putra Malaysia
(Member)

ROBIAH BINTI YUNUS, PhD

Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software

Signature: _____ Date _____

Name and Matric No: Farah Layth Naji, GS40773

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

Signature: _____
Name of Chairman
of Supervisory
Committee: Dr. Tengku Fadilah binti Tengku Kamalden

Signature: _____
Name of Member
of Supervisory
Committee: Dr. Saidon bin Amri

TABLE OF CONTENTS

	Page
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
APPROVAL	iv
DECLARATION	vi
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF APPENDICES	xii
CHAPTER	
1 INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	2
1.3 Objectives of the Study	4
1.4 Research Questions and Hypotheses	4
1.5 Significance of the Study	5
1.6 Limitations of Study	5
1.7 Delimitations of the Study	6
1.8 Definition of the Terms	6
1.8.1 Psychological Distress	6
1.8.2 Physiological Markers	6
1.8.2.1 Salivary IgA (SIgA)	6
1.8.2.2 Pulse rate	7
1.8.2.3 Oxygen saturation	7
1.8.3 Football Players	7
2 LITERATURE REVIEW	8
2.1 Psychological Distress in Sports	8
2.2 Manifestation of Psychological Distress	9
2.3 Measurement of Psychological Distress	10
2.3.1 Questionnaires	11
2.3.1.1 Depression Anxiety Stress Scale (DASS)	11
2.3.2 Physiological Tests	12
2.3.2.1 Salivary IgA	12
2.3.2.2 Pulse Rate	12
2.3.2.3 Oxygen Saturation	13
2.4 A Link between Psychological Distress and Physiological Markers	14
2.4.1 Findings Based on DASS	14
2.4.2 Findings Based on Salivary IgA	14
2.4.3 Findings Based on Pulse rate	15

2.4.4	Findings Based on Oxygen Saturation	16
2.4.5	Study Combination	17
2.5	Summary of the chapter	17
3	METHODOLOGY	18
3.1	Research Design	18
3.2	Participants and Population	20
3.3	Exclusion Criteria	20
3.4	Procedure	21
3.4.1	Ethical Considerations	21
3.4.2	Research Instrument	21
3.4.2.1	DASS Questionnaire	21
3.4.2.2	Salivary IgA Kit	22
3.4.2.3	Pulse Oximeter	23
3.5	Pre-Test	25
3.6	Pilot Study	25
3.7	Data Collection Procedure	25
3.8	Data Analysis	27
4	RESULTS	28
4.1	Introduction	28
4.2	Demographic data	28
4.3	Analyses of Null Hypotheses	29
4.3.1	Depression	29
4.3.2	Anxiety	30
4.3.3	Stress	31
4.3.4	Salivary IgA	32
4.3.5	Pulse Rate	33
4.3.6	Oxygen Saturation	34
5	DISCUSSIONS, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS	36
5.1	Discussions	36
5.2	Conclusions	39
5.3	Recommendations	40
5.4	Implications	41
	REFERENCES	42
	APPENDICES	54
	BIODATA OF STUDENT	75
	LIST OF PUBLICATIONS	76

LIST OF TABLES

Table	Page
3.1 The Number of Players in each Club	20
3.2 Instruments	21
3.3 Cronbach's Alpha Value of the Instruments	25
4.1 Demographic Details of Players in each Club	29



LIST OF FIGURES

Figure		Page
3.1	Research Framework	19
3.2	Steps of Collecting Saliva	23
3.3	Pulse oximeter	24
3.4	Data collection procedure	26
4.1	Comparison of Depression among Different Measurements	30
4.2	Comparison of Anxiety among Different Measurements	31
4.3	Comparison of Stress among Different Measurements	32
4.4	Comparison of Salivary IgA among Different Measurements	33
4.5	Comparison of Pulse Rate among Different Measurements	34
4.6	Comparison of Oxygen Saturation among Different Measurements	35

LIST OF APPENDICES

Appendix		Page
1	Inform Consent form English Version and Arabic Version	54
2	Ethical Approval	62
3	Approval from Karbala Football Clubs in English and Arabic Version	65
4	DASS Questionnaire in English and Arabic Version	73



CHAPTER 1

INTRODUCTION

1.1 Introduction

Football is one of the most popular sport and it is played practically in all parts of Iraq at various levels of competence (Shehata, 2004). A number of individuals, especially the young are excited about playing this game for different purposes. However, since 1990, it seems that the performance of footballers in Iraq has been at a low level due to the wars (Hammermeister, Pickering, McGraw, & Ohlson, 2012).

A wide range of factors such as physical fitness, stress, nutrition, game load, injuries, finance etc., have an impact on the performance of footballers (Ivarsson, Johnson & Podlog, 2013). Most of the players must participate in a large number of games within leagues. Therefore, the players are under high pressure before and during the game (Dahl, 2013).

Sies (2013) defined 'stress' as the psycho-physiological reaction of an individual caused by several factors which disturb their inner balance. The concept of 'psychophysiological' varies depending on the impatience and tolerance level of an individual to deal with stress. Dahl (2013) mentioned that environmental factors, illness and nutrition factors cause stress leading to anger, aggression, and fear (Gottlieb, 2013). Individual players are at high risk of injury at the time when they have stress due to the loss of their attention (Ekstrand & Torstveit, 2012).

Selye (2013) states that high levels of stress and anxiety including the feeling of fear occur at a particular incidence and situation. The possible symptoms of anxiety are nausea, low motor coordination, low aggression and loss of composure. Other possible factors that may cause anxiety among the players are climatic change, high temperature, and humidity. The level of stress depends on the inner experience and perception of the players. Ekstrand and Torstveit (2012) revealed the important role of attention of players in the match. Any possible factor that causes stress needs to be resolved or the performance of players will be affected. The majority of the players perform better when relaxed and they can make effective decisions during the match which may help them to win the game. Players with a high level of stress tend to make wrong decisions at crucial moments because their decisions are influenced by pressure. This is why successful players try to stay calm because high pressure reduces the ability of the individual and they need to be motivated and control their anxiety level in order to play in the matches effectively (Dahl, 2013; Johari & Marzuki, 2017; Masten, Tušak, & Faganel, 2006).

According to Liu, Hopkins, and Gómez (2016), stress is cumulative, and other types of stress may directly suppress the immune system. Exercise is not a single stress factor. Other stress factors include family obligations, job responsibilities, financial responsibilities, and social interaction along with other crucial aspects that shape the life of an individual. All these factors affect the body of individual players which could directly affect the immune system. However, when additional stress takes place, the immune system and the mental condition of the players will be affected. Gottlieb (2013) states that the chronic stress negatively affects the different systems in the body. As a result, it has multiple side effects from a short-term revelation on these hormones, which might result in physical damage and mental illness. Individual players who continuously suffer from chronic stress are expected to experience symptoms such as depression, anxiety, and sleep issues. Physical stress in the chronic stress includes the risk of heart diseases, high blood pressure and digestive problems (Hegberg & Tone, 2015; Nicholls, Polman, & Levy, 2012).

Different methods are used to measure psychological stress such as Standard Stress Scale (SSS), Perceived Stress Scale (PSS), Social Readjustment Rating Scale (SRRS), Depression Anxiety Stress Scale (DASS), etc., and physiological stress based on scientific measurements of hormones (cortisol), antibodies (IgA), heart-rate, blood pressure, oxygen saturation, etc. Sports psychologists examine psychological and psychophysiological stress levels of the individual through different measurement methods for the analysis of heart rate, oxygen saturation, salivary IgA, DASS questionnaire (Noyan & Cohen, 2013; Hegberg & Tone, 2015; Pennebaker, 2012).

1.2 Problem Statement

Iraqi football achieved great achievement during the period 1970-1989. However, the wars in 1990 had negatively impacted all fields such as health, education, economics, etc. (Levy & Sidel, 2008; Shehata, 2004). According to the latest international statistics, there was a low percentage of literate people in Iraq; more than seven million Iraqi adults must suffer from illiteracy due to the wars and the economic blockade for more than 13 years (Al-Iraqi, 2015). In Iraq, the DASS questionnaire is widely used to measure the level of stress. The questionnaire has been translated into Arabic (Kimbrel et al., 2014; Street, Gradus et al., 2013) but Iraqi football players still need to read and be able to understand the questions. Unfortunately, some of the players in Karbala province are illiterate and the presentation of questionnaire items may need to be adjusted accordingly.

Hectic playing schedules along with high-level competition could lead to high levels of stress. The players are under high pressure because of the expectations of fans and continuous media reports. The fans expect players to win matches, and the fear of losing games increases anxiety and stress levels. The majority of the players suffer from pre-match stress, and team captains make great effort to implement different ways to motivate players and prevent them from suffering stress issues.

As stated by Feige, Morimoto, and Polla (2013), athletic stress is known as physiological and emotional responses at the time of difficult situations. For instance, an individual perceives the competitive demand higher than the player's ability. The reaction of stress is prolonged and intense, which affects game performance. The physiological symptom of stress includes high heart rate, fatigue, muscle tightness, and sweating, etc. Meanwhile, emotional stress reaction includes difficulty in concentration, making wrong decisions, nervousness and frustration. During the games and competition, it is important for the players to know how to manage the reaction of stress and use it as an advantage to win the game.

The immune system works as a defense mechanism; and it is based on the tissues, organs, cells along with cell products that work together to fight against the damaging substances (Reed and Raison, 2016). The damaging substances include pathogens which can result in diseases and infection. There are two crucial ways stress negatively influences the immune system. The first is that it formulates chronic inflammatory illness; and the second is that it minimizes the immunity of those who have strong and healthy immune systems. Therefore, individuals who are suffering from chronic social conflict are expected to have high stress; and it weakens the overall immune system to infectious and autoimmune illness (Jones & Thomsen, 2013).

Psychological distress is to measure psychological stress, depression and anxiety in general by using questionnaire such as Standard Stress Scale (SSS), Perceived Stress Scale (PSS), Social Readjustment Rating Scale (SRRS), Depression Anxiety Stress Scale (DASS), etc. Despite the significant impact of stress on psychological and physical aspects of the players, the common method used in the sports field to measure stress in Iraq is the DASS questionnaire. Nevertheless, it takes a long time to collect and analyze data through the questionnaire due to the relatively high number of illiterate respondents. According to Bourgeois, LeUnes and Meyers (2010), using the DASS questionnaire is an old method for measuring stress among individuals. This method is also regarded as complex because it has numerous domains associated with stress among individuals. Moreover, the DASS permits quantifying the seriousness of a patient's indications yet, the methods by which a patient's reaction to treatment can be measured. This approach is commonly used and can add to the analysis of anxiety or depression using other instruments. However, the DASS instrument is unable to assess the various side effects of depression and it is not intended to supplant a thorough clinical meeting (Masten, 2006). Additionally, due to its complexity and the poor literary used among Iraqi footballers, the use of the DASS questionnaire alone may not be appropriate for the measurement of the stress levels among Iraqi football players.

With the above in mind, alternative methods of measuring stress should be used concurrently. These methods include the measurement of physiological markers such as hormones (cortisol), antibodies (IgA), heart-rate, blood pressure, oxygen saturation, etc. However, some of these methods are expensive, and it is difficult to carry out in Iraq. Therefore, it will be more effective if there are alternative methods to measure stress levels of players via physiological markers. The suggested alternatives are the

measurement of salivary IgA, pulse rate, and oxygen saturation (Aşçı, 2016). For this reason, the main aim of the current research was to determine and compare the differences between psychological distress as measured through the DASS questionnaire with physiological markers measured through salivary IgA (SIgA), pulse rate and oxygen saturation during football training and competitive matches.

1.3 Objectives of the Study

The objective of this study is to determine the level of stress among the football players of the first division clubs in Karbala using different stress measurement methods (DASS questionnaire, SIgA, Pulse rate and Oxygen Saturation) at different stages (during resting time, before training match, after training match, before competition match and after competition match).

1.4 Research Questions and Hypotheses

To achieve the research objectives, one research question was addressed to determine and investigate the changing levels of DASS questionnaire, SIgA, Pulse Rate and Oxygen saturation of the football players. The hypotheses are also stated based on the measured variables. The details of research questions and hypotheses based on research objectives are presented as follows:

Research Questions:

RQ1: What is the depression level among the football players of the first division clubs in Karbala measured using the DASS questionnaire during resting time, before training matches, and before competition matches?

RQ2: What is the anxiety level among the football players of the first division clubs in Karbala measured using the DASS questionnaire during resting time, before training matches, and before competition matches?

RQ3: What is the stress level among the football players of the first division clubs in Karbala measured using the DASS questionnaire during resting time, before training matches, and before competition matches?

RQ4: What is the stress level among the football players of the first division clubs in Karbala measured using SIgA during resting time, before training matches, and before competition matches?

RQ5: What is the stress level among the football players of the first division clubs in Karbala measured using pulse rate during resting time, before training matches, and before competition matches?

RQ6: What is the stress level among the football players of the first division clubs in Karbala measured using oxygen saturation during resting time, before training matches, and before competition matches?

Research Hypothesis:

H₀₁: There are no significant differences in Depression during resting time, before the training and before the competition among football players of the first division clubs in Karbala.

H₀₂: There are no significant differences in Anxiety during resting time, before the training and before the competition among football players of the first division clubs in Karbala.

H₀₃: There are no significant differences in Stress during resting time, before the training and before the competition among football players of the first division clubs in Karbala.

H₀₄: There are no significant differences in Salivary IgA during resting time, before the training, after the training, before the competition and after the competition among the football players of the first division clubs in Karbala.

H₀₅: There are no significant differences in Pulse rate during resting time, before the training, after the training, before the competition and after the competition among the football players of the first division clubs in Karbala.

H₀₆: There are no significant differences in Oxygen saturation during resting time, before the training, after the training, before the competition and after the competition among the football players of the first division clubs in Karbala.

1.5 Significance of the Study

The researcher conducted this study because the researcher emphasizes the impact of stress on the performance and health of the players. This research aims to determine the levels and investigate the changes between the psychological distress and physiological markers among the football players of the first division clubs in Karbala during the resting time, before the training, after the training, before the competition, and after the competition. It is believed that the findings of the research are useful as it can contribute and help improve the knowledge of the coaches and football players to deal with stress. Moreover, it identifies how the level of stress affects the immune system of athletes along with the changes in their pulse rate, oxygen saturation, depression, anxiety and stress levels. Therefore, this study gives an idea if physiological markers can be used to measure stress and can be used in a combination with the DASS questionnaire to provide more accurate results.

1.6 Limitations of Study

Although the results of this research are practical and have useful implications, some limitations should be considered when interpreting the results. It is very difficult to control the circumstances of the surrounding areas such as the weather temperature, pollution, and samples. Some studies showed that high external temperature on can increase heart rate (Dahl, 2013; El Helou et al., 2012; Rushall, 1990), and, if the organs of the body are stressed at high levels, the performance of the players is negatively affected (Cahill et. al. 2013; Dahl, 2013). Pollution also affects the pulmonary and

vascular systems which in turn, impact blood pressure and heart rate. El Helou et al. (2012) indicated that weather temperature has a strong impact on heart rate and performance of the athletes. The results of marathon runners from 2001 to 2010 indicated that when air temperature increases, the speed of runners decreases, and the withdrawal rates increase. On the other hand, this study conducted in the first division clubs of Karbala province in the first division league season (2016-2017).

1.7 Delimitations of the Study

The following delimitation was set by the researcher. First, this study included only the first division clubs of Karbala province in the first division league season (2016-2017), between 18 and 22 of age male. Second, since Iraq is one of the war regions, only a few provinces are safe, and Karbala is the safest province to do the research. As such, the results may not be generalizable to other age, gender, and place.

1.8 Definition of the Terms

The following definitions contribute to a better understanding of the basic terms used in the current study.

1.8.1 Psychological Distress

According to Segrin and Badger (2014), Psychological Distress is defined as the unpleasant feelings and emotions which impact a person's level of function. It is a situation where human mind's activity is conflicting due to the external pressure and internal logic. Psychological distress causes physical unfitness and health issues. In the current study, psychological distress includes depression, anxiety, and stress. To measure psychological stress in general, DASS questionnaire 21 was used among football players during the resting time, before training match, and before competitions match.

1.8.2 Physiological Markers

Physiological markers are different methods to measure physiological stress.

1.8.2.1 Salivary IgA (SIgA)

It is the main immunoglobulin found in secretions such as mucus by tears, salivary and mammary glands. SIgA plays an important role in the protection of lungs, oral cavity, and guts. The level of SIgA varies within human's body, and it is high in salivary glands. SIgA has a direct interaction with the nervous system; the saliva level varies when a person gives a response to mental and physical stress (Pfaffe, 2011). In

this study, salivary IgA was gathered from the mouth by letting saliva drop in a special tube for collecting saliva to measure physical stress by using Salivary Secretory IgA Indirect Enzyme Immunoassay Kit among football players during the resting time, before the training match, after the training match, before the competition match, and after the competition match.

1.8.2.2 Pulse rate

It is the measurement of heart rate by counting how many times a person's heart is beaten in one minute. Pulse is the measurement which shows the beats of the heart per minute. A healthy person's heart beats have 40 to 60 pulse rate per minute. Pulse rate and heartbeat occur when a heart pushes blood to arteries and then arteries expand and contract because of the blood flow (Karmakar et al., 2011). In this study, pulse rate is a person's heartbeat that was measured from the sample's index finger to measure physical stress by using pulse oximeter among football players during the resting time, before the training match, after the training match, before the competition match, and after the competition match.

1.8.2.3 Oxygen saturation

Oxygen saturation is defined as the fraction of oxygen saturated hemoglobin relative to the total hemoglobin (unsaturated + saturated) in the blood. From previous studies, it is analyzed that a minimum level of oxygen in blood is required by the human body. The normal blood oxygen levels in the human body are in a range of 96- 99 or 100%. However, stress related to sports can significantly influence the oxygen saturation in blood (Casey, 2011). In the current study, oxygen saturation is the level of oxygen saturated in a person's hemoglobin that was measured from the sample's index finger to measure physical stress by using pulse oximeter among football players during the resting time, before the training match, after the training match, before the competition match, and after the competition match.

1.8.3 Football Players

Sharab (2011) defined a football player as someone who plays football, especially who considers playing football as their job. In this study, football players include all the first division clubs in Karbala province, namely Al-husseinya club, Al-hur club, Al-gadharah club and Al-hindia club. The total football players of the four clubs in season (2016-2017) were (n=114). However, only (n=74) players were included in this study after excluding those who were injured, unhealthy, addicted to the drug, smokers, drink alcohol, received antibiotic therapy within two months before the study, took anti-inflammatory drugs, took supplementation, or had a cold. Their age range is between 18-22 years old, and all of them have 3 or more years of football playing experiences. All the players are males.

REFERENCES

- Adler, P., & Adler, P. A. (1985). From idealism to pragmatic detachment: The academic performance of college athletes. *Sociology of Education*, 241-250.
- Adler, P., & Adler, P. A. (1987). Role conflict and identity salience: College athletics and the academic role. *The Social Science Journal*, 24(4), 443-455.
- Ali, A. M., Ahmed, A., Sharaf, A., Kawakami, N., Abdeldayem, S. M., & Green, J. (2017). Analysis of the Arabic version of The Depression Anxiety Stress Scale-21: cumulative scaling and discriminant validity testing. *Asian Journal of Psychiatry*.
- Al-Iraqi, A. (2015, September 8). Planning: Illiteracy Rate in Iraq Reached 18%, most of them Females. *Alsumarianews*, Retrieved from <http://www.alsumaria.tv/news/145667/-18-بلغت-العراق-الامية-في-التخطيط-نسبة-الامية-في-العراق-بلغت-18-الك/ar#>
- Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychological assessment*, 10(2), 176.
- Armstrong, S., & Oomen-Early, J. (2009). Social connectedness, self-esteem, and depression symptomatology among collegiate athletes versus nonathletes. *Journal of American College Health*, 57(5), 521-526.
- Aşçı, A. (2016). Heart Rate Responses during Small Sided Games and Official Match-Play in Soccer. *Sports*, 4(2), 31.
- Bakken, B. S., & Azami, S. V. (2016). *Personlighetstrekk og opplevelse av negativt stress* (Bachelor's thesis).
- Bangsbo, J., Hansen, P. R., Dvorak, J., & Krstrup, P. (2015). Recreational football for disease prevention and treatment in untrained men: a narrative review examining cardiovascular health, lipid profile, body composition, muscle strength and functional capacity. *Br J Sports Med*, 49(9), 568-576.
- Bara-Filho, M. G., Freitas, D. S., Moreira, D., Matta, M. d. O., Lima, J. R. P. d., & Nakamura, F. Y. (2013). Heart rate variability and soccer training: a case study. *Motriz: Revista de Educação Física*, 19(1), 171-177.
- Bevegård, B. S., Holmgren, A., & Jonsson, B. (1963). Circulatory studies in well trained athletes at rest and during heavy exercise, with special reference to stroke volume and the influence of body position. *Acta Physiologica*, 57(1-2), 26-50.

- Bourgeois, A., LeUnes, A., & Meyers, M. (2010). Full-scale and short-form of the Profile of Mood States: A factor analytic comparison. *Journal of Sport Behavior*, 33(4), 355.
- Bryman, A., & Cramer, D. (1999). Quantitative data analysis with SPSS release 8 for Windows. *A guide for social scientists*. London and New York: Taylor & Francis Group.
- Bunn, J., Manor, J., Wells, E., Catanzarito, B., Kincer, B., & Eschbach, L. C. (2017). Physiological and emotional influence on heart rate recovery after submaximal exercise. *Journal of Human Sport and Exercise*, 12(2).
- Byrne, B. M. (2013). Structural equation modeling with AMOS: Basic concepts, applications, and programming. Routledge.
- Cahan, S. F., De Villiers, C., Jeter, D. C., Naiker, V., & Van Staden, C. J. (2016). Are CSR disclosures value relevant? Cross-country evidence. *European Accounting Review*, 25(3), 579-611.
- Calder, P. C., & Yaqoob, P. (2013). *Diet, immunity and inflammation*. Amsterdam, Netherlands: Elsevier.
- Casey, G. (2011). Pulse oximetry-what are we really measuring? *Kai Tiaki: Nursing New Zealand*, 17(3), 24.
- Chrousos, G. P., Loriaux, D. L., & Gold, P. W. (2013). *Mechanisms of physical and emotional stress* (Vol. 245). Berlin, Germany: Springer Science & Business Media.
- Coelho, D. B., Mortimer, L. Á., Condessa, L. A., Morandi, R. F., Oliveira, B. M., Marins, J. C. B., ... & Garcia, E. S. (2011). Intensity of real competitive soccer matches and differences among player positions. *Revista Brasileira de Cineantropometria & Desempenho Humano*, 13(5), 341-347.
- Corrêa, A., Viecili, P., & Callegaro, C. (2015). Heart Rate Recovery is Blunted in Soccer Athletes During a Competitive Season. *J Sports Med Doping Stud*, 5(166), 2161-0673.100016.
- Daglioglu, O. M. B. B. O. O. M., & Demir, T. (2013). The effect of short term exercise on oxygen saturation in soccer players - Google Search. *Australian Journal of Basic and Applied Sciences*, 7 (10)(1991-8178), 446-449.
- Dahl, K. D. (2013, September 4). External Factors and Athletic Performance. Retrieved from <http://digitalcommons.liberty.edu/honors/347>
- De Francisco, C., Arce, C., del Pilar Vílchez, M., & Vales, Á. (2016). Antecedents and consequences of burnout in athletes: Perceived stress and depression. *International Journal of Clinical and Health Psychology*, 16(3), 239-246.

- DeMeulenaere, S. (2007). Pulse oximetry: uses and limitations. *The Journal for Nurse Practitioners*, 3(5), 312-317.
- Diab, M. K., & Al-Ali, A. (2013). *U.S. Patent No. 8,532,728*. Washington, DC: U.S. Patent and Trademark Office.
- Drapeau, A., Marchand, A., & Beaulieu-Prévost, D. (2012). Epidemiology of psychological distress, mental illnesses—Understanding, prediction and control, Prof. Luciano LaBate (Ed.), ISBN: 978-953-307-662-1, InTech. doi: 10.5772/30872.
- Drew, M. K., Vlahovich, N., Hughes, D., Appaneal, R., Peterson, K., Burke, L., . . . Lovell, G. (2017). A multifactorial evaluation of illness risk factors in athletes preparing for the Summer Olympic Games. *Journal of Science and Medicine in Sport*.
- Drezner, J. A., Fischbach, P., Froelicher, V., Marek, J., Pelliccia, A., Prutkin, J. M., . . . Ackerman, M. J. (2013). Normal electrocardiographic findings: recognising physiological adaptations in athletes. *Br J Sports Med*, 47(3), 125-136.
- Dukic, J. (2011). *Dualistic model of passion and mental health in a sample of Canadian student-athletes* (Doctoral dissertation).
- El Helou, N., Tafflet, M., Berthelot, G., Tolaini, J., Marc, A., Guillaume, M., . . . Toussaint, J.-F. (2012). Impact of environmental parameters on marathon running performance. *PloS one*, 7(5), e37407.
- Euler, U. (2012). *Evaluation of stress by quantitative hormone studies*. Paper presented at the Proceedings of the 1st International Symposium on Basic Environmental Problems of Man in Space.
- Fahlman, M., Engels, H., Morgan, A., & Kolokouri, I. (2001). Mucosal IgA response to repeated wingate tests in females. *International journal of sports medicine*, 22(02), 127-131.
- Fahlman, M. M., & Engels, H.-j. (2005). Mucosal IgA and URTI in American college football players: a year longitudinal study. *Medicine and science in sports and exercise*, 37(3), 374-380.
- Feige, U., Morimoto, R. I., & Polla, B. (2013). *Stress-inducible cellular response*. Retrieved from <http://books.google.com>
- Filaire, E., Lac, G., & Pequignot, J.-M. (2003). Biological, hormonal, and psychological parameters in professional soccer players throughout a competitive season. *Perceptual and Motor Skills*, 97(3_suppl), 1061-1072.
- Fisher, R., McLellan, C., & Sinclair, W. (2015). The Validity and Reliability for a Salivary Cortisol Point of Care Test. *J Athl Enhancement* 4: 4. of, 6, 2.

- Fletcher, D., & Scott, M. (2010). Psychological stress in sports coaches: A review of concepts, research, and practice. *Journal of Sports Sciences*, 28(2), 127-137.
- Fredericks, S., Fitzgerald, L., Shaw, G., & Holt, D. W. (2012). Changes in salivary immunoglobulin A (IgA) following match-play and training among English premiership footballers. *Med J Malaysia*, 67(2), 155.
- Geertsema, C., Williams, A. B., Dzendrowskyj, P., & Hanna, C. (2008). Effect of commercial airline travel on oxygen saturation in athletes. *British journal of sports medicine*, 42(11), 877-881.
- George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. 11.0 update () Allyn & Bacon: Boston.
- Georgin-Lavialle, S., Gaillard, R., Moura, D., & Hermine, O. (2016). Mastocytosis in adulthood and neuropsychiatric disorders. *Translational Research*, 174, 77-85. e71.
- Gerber, M., Kalak, N., Lemola, S., Clough, P. J., Pühse, U., Elliot, C., . . . Brand, S. (2012). Adolescents' exercise and physical activity are associated with mental toughness. *Mental Health and Physical Activity*, 5(1), 35-42.
- Gleeson, M., Bishop, N., Oliveira, M., McCauley, T., Tauler, P., & Muhamad, A. S. (2012). Respiratory infection risk in athletes: association with antigen-stimulated IL- 10 production and salivary IgA secretion. *Scandinavian journal of medicine & science in sports*, 22(3), 410-417.
- Gottlieb, B. H. (2013). *Coping with chronic stress*. Retrieved from <http://books.google.com>
- Gruber, J., Kogan, A., Quoidbach, J., & Mauss, I. B. (2013). Happiness is best kept stable: positive emotion variability is associated with poorer psychological health. *Emotion*, 13(1), 1.
- Hamamura, T., & Laird, P. G. (2014). The effect of perfectionism and acculturative stress on levels of depression experienced by East Asian international students. *Journal of Multicultural Counseling and Development*, 42(4), 205-217.
- Hammermeister, J., Pickering, M. A., McGraw, L., & Ohlson, C. (2012). The relationship between sport related psychological skills and indicators of PTSD among stryker brigade soldiers: the mediating effects of perceived psychological resilience. *Journal of sport behavior*, 35(1), 40.
- Hart, J., Kraut, M. A., Womack, K. B., Strain, J., Didehbani, N., Bartz, E., . . . Cullum, C. M. (2013). Neuroimaging of cognitive dysfunction and depression in aging retired National Football League players: a cross-sectional study. *JAMA neurology*, 70(3), 326-335.

- Hayashida, H., Dolan, N. J., Hounscome, C., Alajmi, N., & Bishop, N. C. (2015). Salivary SIgA responses to acute moderate–vigorous exercise in monophasic oral contraceptive users. *Applied Physiology, Nutrition, and Metabolism*, 40(9), 863-867.
- Hegberg, N. J., & Tone, E. B. (2015). Physical activity and stress resilience: Considering those at-risk for developing mental health problems. *Mental Health and Physical Activity*, 8, 1-7.
- Helsen, C., Kerkhofs, S., Clinckemalie, L., Spans, L., Laurent, M., Boonen, S., . . . Claessens, F. (2012). Structural basis for nuclear hormone receptor DNA binding. *Molecular and cellular endocrinology*, 348(2), 411-417.
- Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British journal of clinical psychology*, 44(2), 227-239.
- Hiller, N., Mirschink, P., Merkel, C., Knels, L., Oertel, R., Christ, T., ... & Stehr, S. N. (2013). Myocardial accumulation of bupivacaine and ropivacaine is associated with reversible effects on mitochondria and reduced myocardial function. *Anesthesia & Analgesia*, 116(1), 83-92.
- Hogue, C. M., Fry, M. D., Fry, A. C., & Pressman, S. D. (2013). The influence of a motivational climate intervention on participants' salivary cortisol and psychological responses. *Journal of Sport and Exercise Psychology*, 35(1), 85-97.
- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspectives on Psychological Science*, 10(2), 227-237.
- How To Truly Know If You're Recovering Properly After Workouts. (2010, October,8). Retrieved from <https://bengreenfieldfitness.com/article/recovery-articles/how-to-figure-out-if-youre-recovering-properly-after-workouts/>
- Howell, M. (2002). Pulse oximetry: an audit of nursing and medical staff understanding. *British Journal of Nursing*, 11(3), 191-197.
- Hull, J. H., Ansley, L., Robson-Ansley, P., & Parsons, J. P. (2012). Managing respiratory problems in athletes. *Clinical Medicine*, 12(4), 351-356.
- Ivarsson, A., Johnson, U., & Podlog, L. (2013). Psychological predictors of injury occurrence: a prospective investigation of professional Swedish soccer players. *Journal of sport rehabilitation*, 22(1), 19-26.
- Johari, J., & Marzuki, N. A. (2017). Stress, Anxiety and Depression. *Gading Journal for the Social Sciences*, 20(01), 16-21.

- Jones, K. A., & Thomsen, C. (2013). The role of the innate immune system in psychiatric disorders. *Molecular and Cellular Neuroscience*, 53, 52-62.
- Jonker, L. C. (2016). *Stress in a college workplace and its relationship with certain correlates and predictive variables*. Stellenbosch: Stellenbosch University,
- Junge, A., & Feddermann-Demont, N. (2016). Prevalence of depression and anxiety in top-level male and female football players. *BMJ open sport & exercise medicine*, 2(1), e000087.
- Karmakar, C. K., Khandoker, A. H., Voss, A., & Palaniswami, M. (2011). Sensitivity of temporal heart rate variability in Poincaré plot to changes in parasympathetic nervous system activity. *Biomedical engineering online*, 10(1), 17.
- Kimbrel, N. A., Evans, L. D., Patel, A. B., Wilson, L. C., Meyer, E. C., Gulliver, S. B., & Morissette, S. B. (2014). The Critical Warzone Experiences (CWE) Scale: Initial psychometric properties and association with PTSD, anxiety, and depression. *Psychiatry Research*, 220(3), 1118-1124.
- Kirmayer, L. J. (1989). Cultural variations in the response to psychiatric disorders and emotional distress. *Social Science & Medicine*, 29(3), 327-339.
- Kirschbaum, C., & Hellhammer, D. H. (1994). Salivary cortisol in psychoneuroendocrine research: recent developments and applications. *Psychoneuroendocrinology*, 19(4), 313-333.
- Klaperski, S., von Dawans, B., Heinrichs, M., & Fuchs, R. (2013). Does the level of physical exercise affect physiological and psychological responses to psychosocial stress in women?. *Psychology of Sport and Exercise*, 14(2), 266-274.
- Kleinman, A. (2008). *Rethinking psychiatry*. New York, United States of America: Simon and Schuster.
- Lac, G., & Berthon, P. (2000). Changes in cortisol and testosterone levels and T/C ratio during an endurance competition and recovery. *Journal of Sports Medicine and Physical Fitness*, 40(2), 139.
- Levy, B. S., & Sidel, V. W. (2008). *War and public health*. Oxford, United Kingdom: Oxford University Press.
- Li, T.-L., & Rush, B. (2009). The effects of prolonged strenuous exercise on salivary secretion of IgA Subclasses in men.
- Liu, H., Hopkins, W. G., & Gómez, M.-A. (2016). Modelling relationships between match events and match outcome in elite football. *European journal of sport science*, 16(5), 516-525.

- Lopez, S. (2012). Blood Pressure Monitor Fundamentals and Design. *Freescale Semiconductor, Application*.
- Lovallo, W. R. (2015). *Stress and health: Biological and psychological interactions*. California, United States of America: Sage publications.
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour research and therapy*, 33(3), 335-343.
- Lovibond, S. H., & Lovibond, P. F. (1993). Manual for the Depression Anxiety Stress Scales (DASS). Australia: Psychology Foundation of Australia.
- Ludvigson, C. L. (2013). *Health Risk Behaviors of Female Student-Athletes and the Relationship to Social Support and Athletic Identity*: ERIC.
- Manna, I., Khanna, G. L., & Dhara, P. C. (2010). Effect of training on physiological and biochemical variables of soccer players of different age groups. *Asian journal of sports medicine*, 1(1), 5.
- Markser, V. Z. (2011). Sport psychiatry and psychotherapy. Mental strains and disorders in professional sports. Challenge and answer to societal changes. *European archives of psychiatry and clinical neuroscience*, 261(2), 182.
- Masten (ed.), A. S., Masten, A. S., Rolf, J. (Ed.), Cicchetti, D. (Ed.), Nuechterlein, K. (Ed.), & Weintraub, S. (Ed.) (1990). *Risk and protective factors in the development of psychopathology*. New York, NY: Cambridge University Press.
- Masten¹, R., Tušak, M., & Faganel, M. (2006). Impact of identity on anxiety in athletes. *Kinesiology*, 38(2), 126-134.
- Milanez, V. F., Ramos, S. P., Okuno, N. M., Boullosa, D. A., & Nakamura, F. Y. (2014). Evidence of a non-linear dose-response relationship between training load and stress markers in elite female futsal players. *Journal of sports science & medicine*, 13(1), 22.
- Mirowsky, J., & Ross, C. E. (2002). Measurement for a human science. *Journal of Health and Social Behavior*, 152-170.
- Mitchell, J. H., Haskell, W., Snell, P., & Van Camp, S. P. (2005). Task Force 8: classification of sports. *Journal of the American College of Cardiology*, 45(8), 1364-1367.
- Moreira, A., Bacurau, R. F. P., Napimoga, M. H., Arruda, A. F., Freitas, C. G., Drago, G., & Aoki, M. S. (2013). Salivary IL-21 and IgA responses to a competitive match in elite basketball players. *Biology of sport*, 30(4), 243.

- Morgans, R., Orme, P., Anderson, L., Drust, B., & Morton, J. P. (2014). An intensive winter fixture schedule induces a transient fall in salivary IgA in English Premier League soccer players. *Research in Sports Medicine*, 22(4), 346-354.
- Morgans, R., Owen, A., Doran, D., Drust, B., & Morton, J. P. (2015). Prematch salivary secretory immunoglobulin A in soccer players from the 2014 World Cup qualifying campaign. *International journal of sports physiology and performance*, 10(3), 401-403.
- Moussa, M. T., Lovibond, P., Laube, R., & Megahead, H. A. (2017). Psychometric properties of an arabic version of the depression anxiety stress scales (DASS). *Research on Social Work Practice*, 27(3), 375-386.
- Musa, R., Ramli, R., Yazmie, A. W. A., Khadijah, M. B. S., Hayati, M. Y., Midin, M., . . . Ravindran, A. (2014). A preliminary study of the psychological differences in infertile couples and their relation to the coping styles. *Comprehensive psychiatry*, 55, S65-S69.
- National Collaborating Centre for Mental Health (UK. (2010). Depression: the treatment and management of depression in adults (updated edition). British Psychological Society.
- Naumova, E. A., Sandulescu, T., Benson, S., Engler, H., Schedlowski, M., Zimmer, S., . . . Arnold, W. H. (2012). Fluoride bioavailability in saliva during acute psychological stress. *Central European Journal of Medicine*, 7(4), 481-489.
- Nicholls, A. R., Polman, R. C., & Levy, A. R. (2012). A path analysis of stress appraisals, emotions, coping, and performance satisfaction among athletes. *Psychology of sport and exercise*, 13(3), 263-270.
- Norton, P. J. (2007). Depression Anxiety and Stress Scales (DASS-21): Psychometric analysis across four racial groups. *Anxiety, stress, and coping*, 20(3), 253-265.
- Noyan, I. C., & Cohen, J. B. (2013). *Residual stress: measurement by diffraction and interpretation*. Retrieved from <http://books.google.com>
- Osman, A., Wong, J. L., Bagge, C. L., Freedenthal, S., Gutierrez, P. M., & Lozano, G. (2012). The depression anxiety stress Scales-21 (DASS-21): further examination of dimensions, scale reliability, and correlates. *Journal of clinical psychology*, 68(12), 1322-1338.
- Pallant, J. (2010). *SPSS survival manual: A step by step guide to data analysis using SPSS*: Open University Press.
- Patel, D. R., Omar, H., & Terry, M. (2010). Sport-related performance anxiety in young female athletes. *Journal of Pediatric and Adolescent Gynecology*, 23(6), 325-335.

- Papacosta, E., & Gleeson, M. (2013). Effects of intensified training and taper on immune function. *Revista Brasileira de Educação Física e Esporte*, 27(1), 159-176.
- Papadopoulos, E. (2013). Interaction between stress and immunity during a week leading to competition in young athletes.
- Papadopoulos, E., Muir, C., Russell, C., Timmons, B., Falk, B., & Klentrou, P. (2014). Markers of biological stress and mucosal immunity during a week leading to competition in adolescent swimmers. *Journal of immunology research*, 2014.
- Pennebaker, J. W. (2012). *The psychology of physical symptoms*. Retrieved from <http://books.google.com>
- Pfaffe, T., Cooper-White, J., Beyerlein, P., Kostner, K., & Punyadeera, C. (2011). Diagnostic potential of saliva: current state and future applications. *Clinical chemistry*, 57(5), 675-687.
- Podstawski, R., Boraczyński, M., Nowosielska-Swadźba, D., & Zwolińska, D. (2014). Heart rate variability during pre-competition and competition periods in volleyball players. *Biomedical Human Kinetics*, 6(1).
- Pretto, J. J., Roebuck, T., Beckert, L., & Hamilton, G. (2014). Clinical use of pulse oximetry: official guidelines from the Thoracic Society of Australia and New Zealand. *Respirology*, 19(1), 38-46.
- Progoff, I. (2013). *Jung's psychology and its social meaning: An introductory statement of CG Jung's psychological theories and a first interpretation of their significance for the social sciences* (Vol. 27). Routledge.
- Rabi, Y., Derek Kowal, R., & Ambalavanan, N. (2016). Blood Gases: Technical Aspects and Interpretation. *Assisted Ventilation of the Neonate*, 80.
- Randers, M. B., Andersen, T. B., Rasmussen, L., Larsen, M. N., & Krustrup, P. (2014). Effect of game format on heart rate, activity profile, and player involvement in elite and recreational youth players. *Scandinavian journal of medicine & science in sports*, 24(S1), 17-26.
- Raven, P., Gettman, L., Pollock, M., & Cooper, K. (1976). A physiological evaluation of professional soccer players. *British Journal of Sports Medicine*, 10(4), 209-216.
- Reed, R. G., & Raison, C. L. (2016). Stress and the immune system. In C. Esser (Ed.), *Environmental Influences on the Immune System*(pp. 97-126). Vienna, Austria: Springer.

- Ring, C., Carroll, D., Hoving, J., Ormerod, J., Harrison, L. K., & Drayson, M. (2005). Effects of competition, exercise, and mental stress on secretory immunity. *Journal of Sports Sciences*, 23(5), 501-508.
- Rushall, B. S. (1990). A tool for measuring stress tolerance in elite athletes. *Journal of Applied Sport Psychology*, 2(1), 51-66.
- Salimetrics, L. L. C., & SalivaBio, L. L. C. (2011). Saliva collection and handling advice. Available at www.salimetrics.com. Accessed, 1.
- Salvioli, S., Monti, D., Lanzarini, C., Conte, M., Pirazzini, C., Giulia Bacalini, M., . . . Ostan, R. (2013). Immune system, cell senescence, aging and longevity-inflamm-aging reappraised. *Current pharmaceutical design*, 19(9), 1675-1679.
- Sampaio, J. E., Lago, C., Gonçalves, B., Maçãs, V. M., & Leite, N. (2014). Effects of pacing, status and unbalance in time motion variables, heart rate and tactical behaviour when playing 5-a-side football small-sided games. *Journal of Science and Medicine in Sport*, 17(2), 229-233.
- Sawyer, D. A., Julia, H. L., & Turin, A. C. (1982). Caffeine and human behavior: arousal, anxiety, and performance effects. *Journal of Behavioral Medicine*, 5(4), 415-439.
- Schmitt, L., Regnard, J., Desmarests, M., Mauny, F., Mouro, L., Fouillot, J.-P., . . . Millet, G. (2013). Fatigue shifts and scatters heart rate variability in elite endurance athletes. *PloS one*, 8(8), e71588.
- Schubert, C., Lambert, M., Nelesen, R., Bardwell, W., Choi, J.-B., & Dimsdale, J. (2009). Effects of stress on heart rate complexity-a comparison between short-term and chronic stress. *Biological psychology*, 80(3), 325-332.
- Schutz, S. L. (2001). Oxygen saturation monitoring by pulse oximetry. *AACN procedure manual for critical care*, 4, 77-82.
- Segrin, C., & Badger, T. A. (2014). Psychological and physical distress are interdependent in breast cancer survivors and their partners. *Psychology, health & medicine*, 19(6), 716-723.
- Selye, H. (2013). *Stress in health and disease*. Retrieved from <http://books.google.com>
- Shamsuddin, K., Fadzil, F., Ismail, W. S. W., Shah, S. A., Omar, K., Muhammad, N. A., . . . Mahadevan, R. (2013). Correlates of depression, anxiety and stress among Malaysian university students. *Asian journal of psychiatry*, 6(4), 318-323.

- Shea, T. L., Tennant, A., & Pallant, J. F. (2009). Rasch model analysis of the Depression, Anxiety and Stress Scales (DASS). *BMC psychiatry*, 9(1), 21.
- Shehata, A. (2004, October). The Effect of The War on Iraq. *Aljazeera*, Retrieved from <http://www.aljazeera.net/specialfiles/pages/9b80d6a6-1aef-48e6-a89b-5a2393a11af7>
- Sies, H. (2013). *Oxidative stress*. Retrieved from <http://books.google.com>
- Sompayrac, L. M. (2015). *How the immune system works*. Selangor, Malaysia: John Wiley & Sons.
- Sothmann, M. S., Horn, T. S., Hart, B. A., & Gustafson, A. B. (1987). Comparison of discrete cardiovascular fitness groups on plasma catecholamine and selected behavioral responses to psychological stress. *Psychophysiology*, 24(1), 47-54.
- Spielberger, C. D. (Ed.). (2013). *Anxiety and behavior*. Cambridge, United States of America: Academic Press.
- Stevens, R. E., Loudon, D. L., Yow, D. A., Bowden, W. W., & Humphrey, J. H. (2013). *Stress in college athletics: Causes, consequences, coping*: Routledge.
- Strahler, K., Ehrlenspiel, F., Heene, M., & Brand, R. (2010). Competitive anxiety and cortisol awakening response in the week leading up to a competition. *Psychology of sport and exercise*, 11(2), 148-154.
- Street, Amy E., Jaimie L. Gradus, Hannah L. Giasson, Dawne Vogt, and Patricia A. Resick. "Gender differences among veterans deployed in support of the wars in Afghanistan and Iraq." *Journal of General Internal Medicine* 28, no. 2 (2013): 556-562.
- Streiner, D. L., Norman, G. R., & Cairney, J. (2015). *Health measurement scales: a practical guide to their development and use*: Oxford University Press, USA.
- Stuempfle, K. J., & Hoffman, M. D. (2015). Gastrointestinal distress is common during a 161-km ultramarathon. *Journal of sports sciences*, 33(17), 1814-1821.
- Taber, K. S. (2017). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 1-24.
- Target Heart Rates. (2016, October 12). Retrieved from <https://healthyforgood.heart.org/move-more/articles/target-heart-rates>
- Taskin, H., Erkmen, N., & Cicioglu, I. (2014). The Examination of the Heart Rate Recovery after Anaerobic Running in Soccer Players. *Collegium antropologicum*, 38(1), 207-211.

- Thayer, J. F., Åhs, F., Fredrikson, M., Sollers, J. J., & Wager, T. D. (2012). A meta-analysis of heart rate variability and neuroimaging studies: implications for heart rate variability as a marker of stress and health. *Neuroscience & Biobehavioral Reviews*, 36(2), 747-756.
- Torres-Platas, S. G., Hercher, C., Davoli, M. A., Maussion, G., Labonté, B., Turecki, G., & Mechawar, N. (2011). Astrocytic hypertrophy in anterior cingulate white matter of depressed suicides. *Neuropsychopharmacology*, 36(13), 2650-2658.
- Vickers, J. N. (2016). Origins and current issues in Quiet Eye research. *Current Issues in Sport Science (CISS)*.
- Weinberg, A., Olvet, D. M., & Hajcak, G. (2010). Increased error-related brain activity in generalized anxiety disorder. *Biological psychology*, 85(3), 472-480.
- Wheat, A. L., & Larkin, K. T. (2010). Biofeedback of heart rate variability and related physiology: A critical review. *Applied psychophysiology and biofeedback*, 35(3), 229-242.
- Wilson, M. (2016). Differences in Depression, Anxiety, and Life Satisfaction between Intercollegiate Athletes, Intramural Participants, and Non-Athletes.
- Yopyk, D. J., & Prentice, D. A. (2005). Am I an athlete or a student? Identity salience and stereotype threat in student-athletes. *Basic and Applied Social Psychology*, 27(4), 329-336.
- Zipes, D. P., Link, M. S., Ackerman, M. J., Kovacs, R. J., Myerburg, R. J., & Estes, N. M. (2015). Eligibility and disqualification recommendations for competitive athletes with cardiovascular abnormalities: task force 9: arrhythmias and conduction defects. *Circulation*, 132(22), e315-e325.