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THE ROLE OF HUMAN ENGINEERING IN REDUCING FUNCTIONAL STREE: AN ANALYTIC STUDY ON THE COLLEGE OF ADMINISTRATION AND ECONOMICS/MUSTANSIRIYAH UNIVERSITY

Lecturer Dr. Sahar Ahmed Kurjidr[1] , Lecturer Dr. Fadiyya Lutfi Abdulwahhab[2]

Assist Lecturer Kawakib Azeez Hammoodi[3]

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Abstract:

The present research seeks to reveal the role of Human Engineering as an independent variable with its four elements (physical work- environment, control and risk prevention, teaching and training, professional health and safety management) in reducing Functional Stress as a dependent variable with its five resources (role characteristics, work nature, Organizational structure, organizational work –environment, social relations).

Due to the importance of these subjects and their effects on persons and organization, and to achieve the aim of the research and the importance of the results expected, the questionnaire has been used as the main tool for data collection and distributing them among the sample members i.e. the 32 instructors who occupy managerial positions in college of Administration and Economics/Mustansiriyah University. The questionnaire has included 33 items.

The problem of the research has been represented by a number of enquiries that help in identifying the relation and effect. To achieve this aim, a hypothetical scheme that includes the two research variables has been built. On the shadow of this scheme, a main hypothesis has been formed, and then four sub-hypotheses have been emerged.

To validate these hypotheses, the researchers have used the descriptive analytic method has been used to treat research variables.

A number of conclusions has been reached. Chief among them is that there is an effect for Human Engineering in reducing Functional Stress. Finally, the research has ended with a number of recommendations; chief among them is supporting the application process of Human Engineering throughout designing everything that may lead to teaching staff better-performance. This is performed through focusing on all elements of Human Engineering in reducing Functional Stress.

Introduction:

Researches have proved that the organizations-success in achieving their aims is measured with a number of variables. Functional Stress is regarded as an important part of these variables, and the most important challenges that organizations face in achieving their aims, let alone the increased competition they face (Al-I'nezy and Al-Juboury,2014:2). Thus, emphasis has been placed on the subject of Human Resources Engineering as a new entrance for finding out suitable solutions for the design-problems of the productive or service process namely about how to accurately make use of human resources capacities to get harmony among (human, machine and environment).

Due to what has been presented before and the importance of this subject, the researchers have chosen this study (Human Engineering and Functional Stress) concerning the connection level, its kind and the effect and its degree.

On this basis and to achieve the aims of the research, and to cover the whole area of the subject, the research has been divided into four parts. The first one is devoted for the research methodology. The next tackles the theoretical aspect including the theoretical background of the two variables. The penultimate part is devoted to the practical aspect. The last one is specialized for a group of conclusions and recommendations.

First Part:

Research Methodology:

First: Research Problem

Human resource is regarded as the main element in the work of any organization. This imposes on the higher administration to pay close attention to working environment throughout providing the suitable circumstances, which are governed by the harmony among the muscular and mental characteristics of human resource and the materials used in working environment. The uncomfortable working environment causes Functional Stress as combined effect of pressures "stresses" represented by the deviation from the natural situation because of being exposed to stressful accidents. This is reflected on the efficiency and proficiency of this important resource of production, a matter that leads to negative results that also affect the efficiency and proficiency of the outputs of their processes.

The research problem lies in two aspects i.e. cognitive and applied. In the cognitive aspect, the problem lies in the rarity of the Arabic theoretical and applied researches and studies that have tackled the two research-variables. In the other aspect, the applied one, the research problem has been identified throughout the researchers' visits to the (College of Administration and Economics/Mustansiriyah University), the research-field, and the personal interviews with a number of teaching staff, a matter that reveals there is a lack of

understanding of the Human Engineering concept, its elements and the fields that give it this notion.

In the shadow of this problem, the following questions arise:

1-Do teaching staff members, in the college under study, have a full clear perception concerning the concept and elements of the two research-variables?

2-Is there an effect of Human Engineering on the Functional Stress in the college under study?

Second: Research Importance

The importance of this research lies in two aspects which are:

1-Scientific Importance: It refers to the scientific enrichment the research adds to the library of managerial sciences in the field of Human Engineering and its role in reducing Functional Stress which workers are exposed to. It is a participation for framing these subjects that have not been given suitable attention.

2-Practical Importance: Here, light is shed on the effective relation between the two research-variables in order to arise the attention for finding the suitable ways by providing a safe good working environment that helps in reducing Functional Stress and its causes in work.

Third: Objectives of the Research

The research aims to show the role of Human Engineering in reducing Functional Stress through performing the following sub-objectives:

1-Introducing a theoretical frame for the teaching staff in the selected college concerning the elements of Human Engineering and its role in reducing Functional Stress with its different resources.

2-Building and then testing a hypothetical scheme to reflect the relation among the Human Engineering elements and its role in reducing Functional Stress.

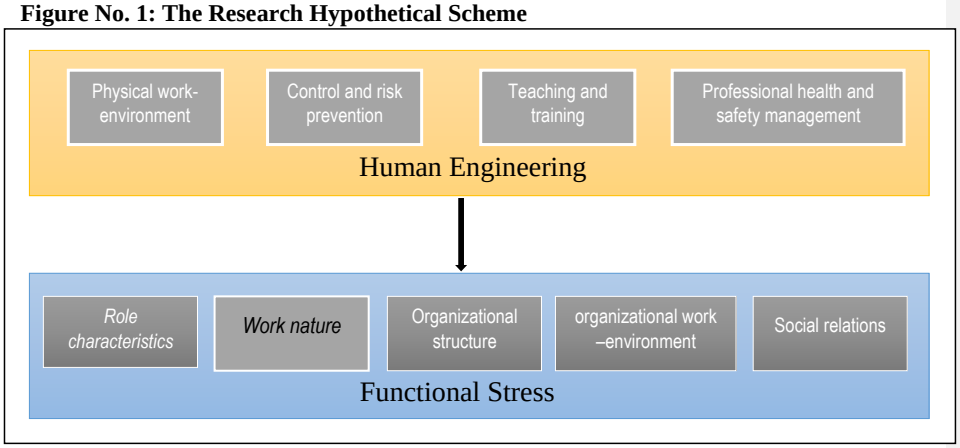
3-Testing the effect relation of Human Engineering on Functional Stress.

4-Introducing some recommendations in the shadow of statistical analysis results of the field reality in a way that helps in treating some of the defects in the two variables the research has depended on.

Fourth: Research Hypothetical Scheme

Systematic treatment of the research problem requires building up a hypothetical scheme or chart for the research that depicts the movement of its independent and dependent variables concerning the nature of the relation and effect directions. Figure No. 1 clarifies this:

Figure No. 1: The Research Hypothetical Scheme



Fifth: Research Hypotheses

On the light of the hypothetical scheme, a main hypothesis has been formed concerning the effect-relation of Human Engineering on Functional Stress.

The main hypothesis states that (There is an abstract effect with statistical significance of Human Engineering in reducing Functional Stress). Four sub-hypotheses are derived from this main one which are as follows:

-First Minor Hypothesis states:
There is an abstract effect with statistical significance of the physical work-environment in reducing Functional Stress.

-Second Minor Hypothesis states:
There is an abstract effect with statistical significance of control and risk prevention in reducing Functional Stress.

-Third Minor Hypothesis states:
There is an abstract effect with statistical significance of teaching and training in reducing Functional Stress.

-Fourth Minor Hypothesis states:
There is an abstract effect with statistical significance of professional health and safety management in reducing Functional Stress.
Sixth: Research Methodology

The research has depended on the descriptive analytic method to achieve its objectives and test its hypotheses since it has a thorough outlook. The field descriptive-analytic method of the phenomenon searched helps in getting accurate and detailed knowledge of the elements of a problem or a phenomenon, and then introducing some conclusions and recommendations that may improving the situation reality.

Seventh: Research Community and Sample

College of Administration and Economics/Mustansiriyah University has been chosen to be the research community for the applied aspect of the research. The research sample, on the other hand, has been represented by teaching staff members who have managerial positions. They are 32 ones among them the questionnaire has been distributed.

Eighth: Data Collection and Analysis

In data collecting, the researchers have depended on the following strategies to reach the research results:

1-make use of various Arabic and foreign references represented by books, theses, dissertations and periodicals, let alone the internet services that have a relation with the research subject to cover the theoretical aspect and reinforce the applied one.

2-The questionnaire form has been prepared to get the data related to the applied aspect since it is regarded as the main tool for doing so. This questionnaire form has been built on the light of the scientific viewpoint that has come from reviewing the related methodologies, which are represented, by two parts. The first one includes measuring the independent variable-items (Human Engineering) while the second one includes measuring the items of the dependent variable (Functional Stress).

Likert fivefold Scale whose value lies between the rank (5)-totally agree, and (1)-totally disagree, has been manipulated to know the opinion of each member in the research sample.

To guarantee the required accuracy of the data that will be obtained, test of validity and reliability for the questionnaire form has been made as explained in the third part of the research (Practical Aspect).

Second Part:

Theoretical Framework:

First Part: Human Engineering

Researchers have tackled various concepts and definitions to express this knowledge field. The concept of Human Engineering has not been the only concept that has been dealt with. There are some other ones that have equally been used to express this concept such as Human Factors, Human Factor Engineering, Human Performance Engineering and Ergonomics which is derived from the Greek word "Ergon" which means "work", while "nomic" refers to the laws and many other biological concepts.(Al-Samman and Al-Obaidy,2013:139).

As far as the definitions of the concept are concerned, there are also various definitions depending of the researchers' stand points concerning "Human Engineering". Bridger (2005:11) states that Human Engineering is regarded as a work-system frame that describes

the analysis levels for human, machine and environment. Gibbs (2006:6) on the other hand emphasizes that human engineering is the scientific principle related to the understanding of interactions among citizens and other components of the system and job that apply the theory, principles and data for designing for the sake of citizens' luxury "welfare" and the total system performance.

Matoushek (2008:2) describes human engineering as the knowledge that is dependent on scientific studies about the public in real working and which are applied to the designing of operations, machines and work places. They are also applied to methods of work and controlling the physical environment to perform the ultimate efficiency for both humans and machines.

Accordingly, the two researchers believe that human engineering represents the study of everything that takes part in providing a suitable working environment that suits the worker's capabilities and machine and creates the ideal work-environment.

Second: Importance of Human Engineering

(Mahrous, 2011:35)summarizes the importance of Human Engineering in the following points:

1-Evaluating the work-design: Focus here is on the analyzing the work into its basic components to get rid of unnecessary ones and surplus time. The level of monotony or repetition, times of rotation and the effort needed are all measured, in addition to evaluating the work as being separate or within the system in its performance strategy.

2-Designing the work-stations: The operations of designing, organizing and evaluating of work stations are dependent on many factors such as mission requirements and the data related to measuring of human body and the measurements and signs that direct the work. Other things will also be assessed such as the heights in work and the state of the worker's body while performing the work, i.e. whether he/she was sitting or standing during the light or heavy work.

3-Fulfilling the working requirements: This factor refers to different aspects related to human resources such as rest and safe to get the best performance in physical resources and human abilities as well.

4-Evaluating the environmental changes: This includes studying the physical work circumstances such as light, sound, temperature, humidity and industrial safety in order to develop and then increase their efficiency.

5-Evaluating the organization of work: Some works require training the workers on the new work-system, a matter that increases the worker's efficiency. It is necessary to separate between the period of training and the time of work. This in turn helps them to get mental clarity and full comprehension reflected on the new work system.

6-Evaluating the performance of human resources: Specialists in human engineering pay great attention to humans within the system. Focus is mainly on many variables that have a relation such as age, sex, size, adequacy and training, customs, experiences, medical history, psychological status and hopes.

Third: Elements of Human Engineering

Researchers' viewpoints concerning the clarification of the elements of Human Engineering differ from one to another. Table No. 1 below is a simple clarification of these elements that have been agreed upon by researchers:

Table No. 1: Elements of Human Engineering

	Element / Researcher	Physical work environment	Designing work-place	Control and risk prevention	Teaching and training	Professional health and safety	High administration commitment and	Medical administration	Analyzing and designing the work	Control and recording	Individual's psychological	Workloads and muscular injuries	Human factors engineering	knowledge	Jobs and work-designing	Mental, psychological and	Professional evaluation
1	Dul and weerdmester 2008	*															
2	Mahrous 2011		*	*	*	*											*
3	Al-Hayaly 2011			*	*		*	*	*	*							
4	Mahmood 2013	*				*					*						
		2	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**

1- Physical work-environment:

The Human Engineering of Ergonomics focuses on productive indicators and it seeks to develop them and pays attention to productivity and performance. This is done through designing work places, tools, equipment, machines and kits taking into consideration the human's body capacities. It gets the information from various sources and it covers the subjects related to psychology and the working style of the worker's jobs and finally life mechanics. It provides knowledge in these fields for designing the work places to develop its performance.(Al-Ali,2006:296).

Human Engineering helps, through designing the work places, in reducing work anxiety. The lack of a suitable working environment that possesses the equipment and tools suitable for the work will increase the disease risks in the work place.(Makhbul et al., 2007:52).

Problems, related to the lack of applying Human Engineering of the working place, can be discovered via the increasing workers' complaints especially those related to health. For instance, there are about 100 injuries due to the unhealthy movements and fatigue, back ache because of performing actions that don't suit their abilities (Al-Ali, 2004:61). The most important factors of physical working environment are:

a-Work position
b-Work Chair
c-Work Surfaces

2-Control and Risk Prevention:

Marras and Karwowski, (2006) say that the first step for developing working places is represented by identifying the development areas or their suggested aspects that have a relation with them. This requires, at the very beginning, data collecting related to the company and professional diseases and work injuries in addition to the quality, productions and the workers' personal archives (Al-Hayaly,2011:317). The worker's safety depends on the accurate planning or scheme, standards, tools and other prevalent circumstances and the nature of the persons required for the work all this information helps in taking accurate decisions or procedures. (Ivan Ceviche, 1995:155, as cited in Mahrous,2011:37).

3-Teaching and Training:

Training is a special teaching activity. It is an activity practiced by the organization to develop the individual's performance in the job he/ she occupies. It is also a means for developing the workers in the organization, and it might be the only means that the organization depends on for this purpose in case it has no programs for developing. In this case, training is expanded to include certain developing activities. But training differs from teaching since training is a teaching process directed towards a specific behavior related to the work whereas teaching gives individual the general acquaintances and qualifications to develop the abilities (Barnoty, 2007:443).

Teaching and Training help the workers in actively applying the managerial concepts and acquiring skills that help them develop quality , reduce working mistakes and do, for the first time, their work accurately.(Al-Khalaf,1997:121 as cited in Mahrous,2011:37).

Marras and Karwowski,,2006) emphasize that the general teaching in the field of Human Engineering needs the existence of an individual who has the ability to design the

programs of Human Engineering and then presents them to the team. He should also have a full knowledge in all training aspects in addition to giving advices and guidance to managers and supervisors of the work and production lines.

4-Professional Health and Safety Management:

One of the basic responsibilities of human resources management is providing health services and industrial safety for all workers since this si an essential part of their duty (Al-Ta'ey et al., 2006:447). Here, Al-Ta'ey differentiates between the concepts of health and safety. The former refers to the individual's health i.e. being safe of mental and body diseases. Safety, on the other hand means the individual's safety of accidents and avoid being in.

The general overview for this responsibility is that the human resources management must pay attention to the health and working safety of the workers through focusing on a safe working area. The work itself may be the source for accidents or diseases which might be very dangerous in some contemporary organizations. This in turns makes this responsibility an urgent one. These injuries are of great importance for the country as well due to their humanistic and economic effects. Accordingly, countries pay attention to organizing this aspect and there couldn't be any nation that has no laws for organizing work accidents and recompensing them. (Barnoty,2007:466).

Second Part: Functional Stress

First: What the Functional Stress is

Functional Stress is considered as a behavioral, functional and social phenomenon resulting from the individuals' interaction with their environment. To explain this phenomenon and reduce its effects, the reasons and resources must be identified. Individuals are always exposed to functional stress and of course there are some reasons behind it. Some individuals are exposed to it more than others; therefore, there are some physical and psychological effects that result from exposing to this strain and tension in the working environment.(Al-I'nezy,2017:555).

Stress is a complex phenomenon that contains different components. The terms and concepts of functional stress are also various due to the researchers' viewpoints themselves. One view states that the word "Stress" is derived from the Latin word "Stringere" which means "to tightly draw". The word "Stress" was used in the 18th century to mean constrain, compulsion, fatigue and tension for the individual or his physical or mental status.(Al-I'nezy and Al-Juboury,2014:11).

Stress can be defined as a complex pattern of a lyric and emotional status and psychological reactions to a group of external stressors. Stress, on the other hand, is the collected effect of stresses. It is mainly represented by the unusual deviation of the normal status due being exposed to these stresses.(Greenburg&Baron,2009:257).

Beehre and Newman define Stress as the state that results from the interactions of working factors with the workers' peculiarities, a matter that results in changes in the physical and psychological status of the worker and later lead him to abnormal behaviors.(Sabir,2009:380).

Bee and Bjorklud (2004) look at stress as the dynamic interaction of an external circumstance facing the individual in a certain place and time. This, in turn, lads him to use

his mental and physical defense against it, and in this case he will be subjected to physical risks depending on his psychological , bodily and social status.(Al-Hilah and Abo-Ajwa,2017:14). Gibson also sees functional stress as the moderated response centralized by personal characteristics and psychological processes. It is the result of an external environmental accident that digs psychological and physical requirements inside individuals. (Hussein,2017:7).

Second: Importance of Functional Stress

Functional Stress has been the focus of many individuals' attention in business organizations due to its great importance let alone the benefits that the organizations might gain if they adopt this concept.

The importance of studying functional Stress lies in that it is an essential realistic means for explaining the individuals' behavior inside organizations whether it is positive or negative one. This also affects the achievement, loyalty, commitment, mastery and production and later to know the positive or negative resultant effects for both the individual and organization. In addition, it is regarded as the organizational basis that provides a suitable healthy environment.(Abdul-Rahmen,2017:161).

Welms et al. (2004) show that Stress affects a great number of organization members. It represents the greatest healthy risks that workers face. Most workers suffer of psychological exhaustion and unstable psychological and physical status because of stress and tension. This requires the organizations to pay close attention to it. The importance of focusing on Functional Stress stems from a number of prospective areas which are (Al-Juboury, 2013:75):

1-**Humaniterian Prospective:**

Modern organizations have a great social responsibility of treating the workers in a good humanitarian manner and as a human treasure that work can't be achieved without it. The minor mechanic view towards the human resources has been changed. What distinguishes the modern administration is the great feeling

of the big social responsibility that directs it to pay attention to workers' psychological and physical comfort and health.

2-**Productive Prospective:**

Modern administration must understand that it will get a great benefit via paying close attention to worker and his health since there is a positive relation between production and worker's physical and psychological health.

3-**Innovative Prospective:**

Innovation and ability to being responsible are related to the safety of mind and body since safe mind is in the safe body.

4-**Financial/Profit Prospective:**

The revenues of investment, as a final result of productivity, is related to individual's safety in various aspects. Chief among them is that the organizations in which healthy and safe individuals are working do not endure great remedial expenses nor do it lose as a result of the workers' absences because of illness. The other reason is that the financial returns are related to the individuals' participations in the creative work and thinking.

Third: Functional Stress Resources "origins"

Many researchers have tried to classify the different resources of Functional Stress resources. These resources will be classified according to main dimensions which have been used in our research (Abdul-Rahman, 2017:161), (Hussein, 2017:9), (Al-I'nezy, 2017:571) and (A-I'nezy and Al-Juboury,2014:17):

1- **Role Characteristics:**

They are related to the ambiguous individual's role in the organization, conflict, heavy duties assigned to him, the shortage of tasks in work and the weak substantiation of the administration to the role assigned to him.

2-**Work Nature:**

It refers to the quality and quantity of work that a worker is in charge to do. The quantity of work is the increase in the responsibilities and duties that exceed the time limits assigned to him i.e. over load. This might create the strain feeling of being unable to perform them in time limits of the work.

The same thing occurs when the work assigned is less than his ability, and he will have an extra time "under load". This makes work less challenging to his abilities. In both cases, this leads to negative results that create the feeling of Functional Stress. To get rid of this, the work quantity must suit the time limit given to the work.

The quality of the work, on the other hand, also has an effect of creating the feeling of Functional Stress. Giving missions and duties to workers that exceed their abilities or the vice versa will also lead to Functional Stress.

3-**Organizational structure:**

Organizational structure is regarded as an essential source of Functional Stress when has a central part in decision making and weakness in communication channels, let alone the weakness of chances of growth and advancement. All this leads individuals be caught by stress inside the organization. Al-Atby and Jaber (2011) see that the managerial procedures inside the organization may be unsuitable and cause loss of time. There might also be a loss in

machines and equipment and unavailability of a accurate plan, all this may create the individual's stress feeling.

4-**Organizational work –environment:**

This expresses the organizational policies followed in the organization such as: wages and rewards and the workers' feeling of their being retributive, the equity and objectivity of the procedures followed in evaluating performance and favoritism and bias as far as this aspect is concerned, a matter that creates the feeling of being unfairly treated among workers, the nature of the supervision process held by the manager and the workers' opportunities to meet the manager and discuss the working matters. All this, of course, causes Functional Stress.

Foreign studies that tackled the relation between work properties and Functional Stress state that the sources of this stress are various, some are related to the work itself whereas are to circumstances outside the working area. Workers also differ in the ways they deal with these sources. Some of them, for instance, may be adjusted and get a benefit of them as a means for getting the identified targets. Others, on the other hand, may fail in tackling them, a matter that may cause him health and psychological problems.

Work properties may be considered as one of the main causes of Functional Stress for the workers. The existence of many or few working responsibilities may lead to this stress. In addition, what may also cause the workers' suffering is the variety of skills that work requires or in case there is a restricted or unlimited independence "autonomy". The scarcity of the information that the workers get related to the evaluation of their works, or in case they feel that the work they perform is unimportant, may also create some sort of anxiety and tension which may later result in Functional stress feeling.

5-**Social Relations:**

They tackle the weakness in the social relations among individuals, the loss social unity and solidarity, the lack of collective support in urgent situations, organizational conflicts and controversies among them and the lack full authorities given to managers and the inferior ones as well.

Third part:

Statistical Analysis of the Field-Study Part:

The present research reflects the use of Constructional emphatic Validity Method to determine the questionnaire items-validity to be accurately suitable for the research "The Role of Human Engineering in Reducing Functional Stress" using Amos Program, and applying Cronbach's Alpha to show the data authenticity that result from distributing the questionnaires among the research sample. This later shows the validity of the questionnaire items. After this, there is a descriptive analysis using weighted Mean, Standard Deviation and Relative Importance for the importance of the independent variable, which expresses the four factors of Human Engineering (physical work- environment, control and risk prevention, teaching and training, professional health and safety management). In addition to this, there is a descriptive analysis for the importance level of the Dependent variable, which is represented by functional stress with its five axes (role characteristics, work nature, Organizational structure, organizational work –environment, social relations). To state the acceptance or rejection of the hypotheses of the effect of Human Engineering in reducing Functional Stress, the researchers have depended on Simple Linear Regression Analysis and Multiple Linear

Regression Analysis and applying F-Test and Effective Relation Scheme using Amos Program No. 25. Then the researchers have turned to use Stepwise Multiple Linear Regression Analysis to diagnose the most effective Human Engineering Axes that help in reducing Functional Stress. They have also made use of SPSS Program No. 25 "Statistical Package for the Social Sciences" in analyzing the data.

First: Tests of Reliability and Validity of the Questionnaire

1-Reliability Test:

Table No. 2 shows that the questionnaire with its thirty three items have all been reliable since the value of Cronbach's Alpha for all the items has been (0.850) which is more than(0.700). This emphasizes that the all the items have completely passed the reliability test. The table has also shows that the value of reliability coefficient of the Human Engineering and Functional Stress items has been (0.808, 0.798) respectively. This indicates the items of both variables i.e. independent and dependent ones are highly reliable.

Table No. 2: Reliability Test-Results via Cronbach's Alpha

Variables		Cronbach's Alpha	Researchers' Comment
Independent	Human Engineering	0.808	There is high reliability in Human Engineering items
Dependent	Functional Stress	0.798	There is high reliability in Functional Stress items
Total questionnaire items		0.850	There is high reliability in questionnaire items

The Emphatic Confirmatory Validity Test via Confirmatory Factor Analysis:

This test is regarded as one of the most common procedures of measuring the questionnaire validity and the accuracy of its formation especially the Confirmatory Factor Analysis is regarded as one of the advanced statistical tools. This factor emphasizes that the five items, found in the first axis of the independent variable, accurately represent the (physical workin-environment, and the four items in the second axis of it represent the control and risk prevention, the four items in the third axis of it expresses teaching and training, and the four items, placed within the fourth axis, represent professional health and safety management.

The Confirmatory Factor Analysis emphasizes that the four axes i.e. (physical work-environment, control and risk prevention, teaching and training, professional health and safety management) accurately represent Human Engineering. (Hajjaj,2013 :171) since this type of analysis is used to confirm the structural validity of the study scale. It also helps in confirming the validity of the model and its conformity for the study data.

To evaluate the quality of the model-conformity, the researchers have used some of the indicators of the quality of the model-conformity. The aim behind this is to test the model-conformity which the researchers have placed for the data that have resulted from distributing the questionnaire among the sample of the research. In other words, the seventeen items that

are placed for the independent variable accurately represent the Human Engineering (Does the proposed model accurately represent the study-data or not?). The conformity-quality indicators reflect a thorough vision about the model conformity as a whole with the study-data.(Teghza, 2012 :229).

The results of using Amos Program No. 25 are clarified in table No. 3 and figure No. 2 as shown below.

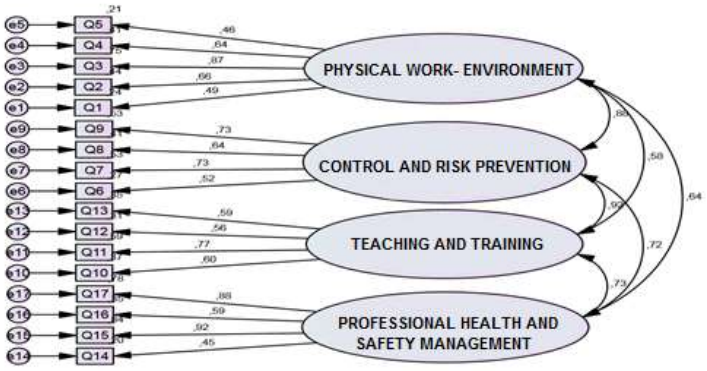


Figure No. 2: Confirmatory Factor Analysis schema "via Amos Program Results" for a model of Human Engineering Scale

Having a look at table No. 3 and figure No. 2 confirms the validity of the items and axes of the independent variable which expresses the Human Engineering. As a result, this emphasizes that (physical working environment, control and risk prevention, teaching and training and professional health and safety management) do all accurately represent Human Engineering.

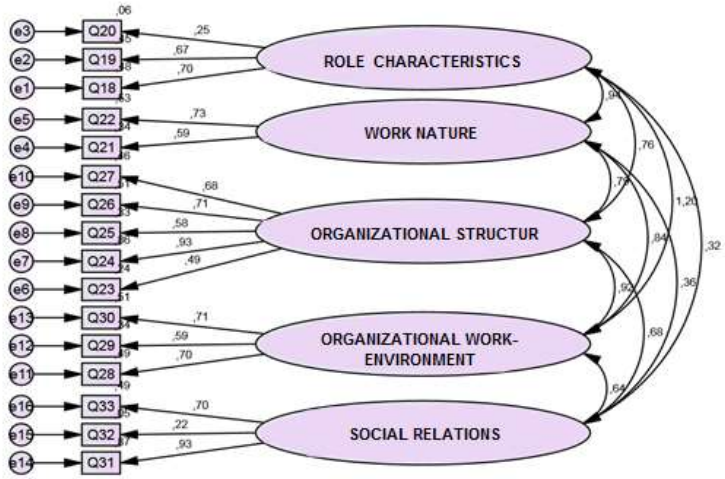
Table No. 3: The values of the model-quality indices for measuring the validity of Human Engineering and Functional Stress Items

Confirmatory Indices	Index Value		Acceptance Standard	Researchers' Comment
	Independent	Dependent		
The Relative Chi-Square	2.314	2.287	Less than 5	All the Confirmatory

Good of Fit Index (GFI)	0.904	0.915	If the index value is more than 0.9, this will indicate the quality of the model.	Factor Analysis results have been immaterial. This accurately confirms the valid representation of the seventeen items specialized for the independent variable of Human Engineering. The validity of the sixteen items specialized for the dependent variable of Functional Stress has also been proved accurately.
Root Mean Square Error Approximation (RMSEA)	0.075	0.069	If the index value is less than or equals 0.05, the model coincides the data. But if is between 0.05 and 0.08, the model is highly coinciding the sample data, otherwise the model will be rejected.	
Normed Fit Index (NFI)	0.636	0.760	The index value lies between 1 and 0, the more being near to 1, the high coincidence there is.	
Comparative Fit Index (CFI)	0.748	0.868	The index value lies between 1 and 0, the more being near to 1, the high coincidence there is.	
Incremental Fit Index (IFI)	0.776	0.902	The index value lies between 1 and 0, the more being near to 1, the high coincidence there is.	
Tucker-Lewis Index (TLI)	0.654	0.754	The index value lies between 1 and 0, the more being near to 1, the high coincidence there is.	

2-The Structural Confirmatory Validity Test via Confirmatory Factor Analysis of the Independent Variable

Table No. 3 and Figure No. 3 have emphasized that the three items found in the first axis of the dependent variable have accurately represented the role characteristics. The two items found in the second axis of the dependent variable represent the work-nature. Also the five items in the third axis express the Organizational structure. The three items that have been placed within the fourth axis of the dependent variable represent the organizational working environment. Within the fifth axis, the three items of the dependent variable placed represent social relations. Accordingly, the Confirmatory Factor Analysis has emphasized that the five axes presented above have accurately represented the Functional Stress. This confirms that the whole sixteen items placed for the dependent variable do accurately represent Functional Strain. Both table No. 3 and figure No. 3 have shown the validity of the items and axes of the dependent variable that expresses the Functional Stress. And as a result, the five axes found within the dependent variable in the research questionnaire have accurately represented the



Functional Stress.

Figure 3: The Confirmatory Factor Analysis Scheme (via Amos Program-Results) for the sample of Functional Stress Scale

Second: Descriptive Analysis of Human Engineering and Functional Stress

In this part, the researchers present the results of the Weighted Means, Standard Deviation and Relative Importance for each item in the questionnaire. To show the response strength, the researchers have depended on Mean which is (3) and which represents the

dividing line between (agree or disagree) within Likert fivefold-Scale. The researchers have also made use of the response-strength matrix to identify the respondent's response level to the questionnaire items as explained in table No. 4:

Table No. 4: The response strength Matrix to the questionnaire items

Weighted Mean Value governed by a period	The strength of response to the resolution paragraphs	Response level
From 1 to less than 1.8	Totally disagreed	Low
From 1.8 to less than 2.6	Disagreed	Low
From 2.6 to less than 3.4	Neutrality	Moderate
From 3.4 to less than 4.2	Agreement	High
From 4.2 up to 5	Totally agreed	High

A look at table No. 5 reveals that the value of the Weighted Mean of Human Engineering has been (3.5543) which is greater than that of the Mean. The value of the Weighted Mean of the independent variable has been within the rate (from 3.4 to less than 4.2) in the response strength matrix. This indicates that the necessity-level of the sample to the Human Engineering items has directed towards agreement with a high level of response and with a standard deviation value at about (1.44469). This indicates that there is slight dispersion in the sample responses to the items of the independent variable, while the relative importance of the same variable has been (71.09%). These results reflect the agreement of all the respondents up on the Human Engineering items.

The axes of the independent variable have been distributed according to the response level as follows: the physical working environment has got the highest response level with a weighted Mean (3.8500) and standard deviation at about (1.32984), relative importance forms (77%). The teaching and training axis has got the lowest level of response among the four axes of Human Engineering. The weighted Mean of the teaching and training axis has been (3.4297) with a standard deviation at about (1.50261) and relative importance at about (68.59%) as shown in figure No. 4:

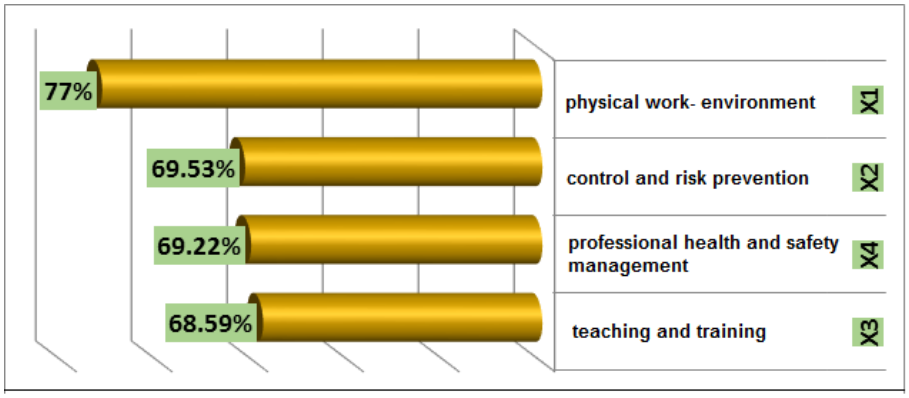


Figure 4: Human Engineering Axes Distributions via Relative Importance

Table No. 5 shows that the value of the Weighted Mean of the Functional Stress has been (3.5786) and it is greater than the value of the supposed Mean. In addition, the value of the Weighted Mean of the dependent variable has been within the rate of (from 3.4 up to less than 4.2) in the response –strength Matrix. This indicates that the level of sample-responses importance to the Functional Stress items has directed towards (Agreement) with a high level of response, and a standard deviation value at about (1.46816). This also indicates that there is a slight dispersion in the sample responses of the dependent variable items, whereas the relative importance of the dependent variable has been (71.57%). Accordingly, these results show that the respondents have agreed upon the whole items of Functional Stress.

The axes of the dependent variable have been distributed as follows: the work- nature axis has got the highest response level with a weighted Mean at about (33.7344), and standard deviation (1.37758) and relative importance at about (74.69%). The table has also indicated that the organizational structure axis or frame has got the lowest response level among the five axes of Functional Stress. The value of the Weighted Mean of the organizational structure has been (3.4188) with a standard deviation (1.45695) and a relative importance at about (68.38%) as explained in figure No. 5:

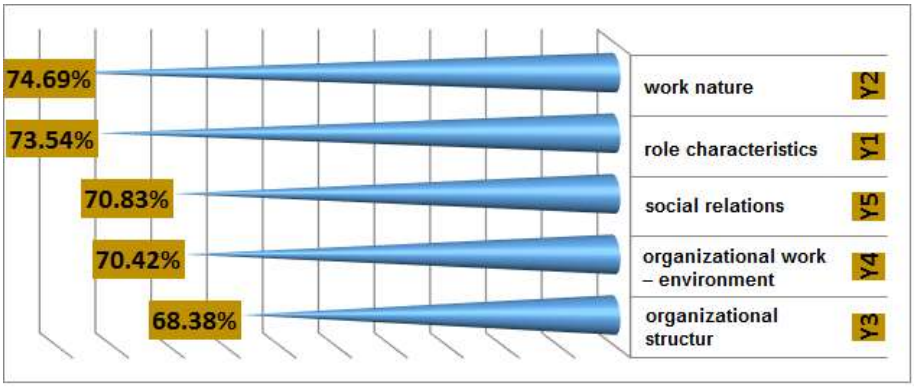


Figure No. 5 **Distribution of Functional Stress Axes via Relative Importance**

Table No. 5: The importance level of the axes of Human Engineering and Functional Stress

Symbol	Feature	Variables	Weighted Mean	Standard Deviation	Relative Importance	Respondent's Response-Level
X1	Independent Variable	Physical working environment	3.8500	1,32984	77%	High
X2		Control and Risk Prevention	3.4766	1.40997	69.53%	High
X3		Teaching and Training	3.4297	1.50261	68.59%	High
X4		Professional Health and Safety Management	3.4609	1.53632	69.22%	High
X		Human Engineering	3.5543	1.44469	71.09%	High
Y1	Dependent Variable	Role Characteristics	3.6771	1.29651	73.54%	High
Y2		Work Nature	3.7344	1.37758	74.69%	High
Y3		Organizational Structure	3.4188	1.45695	68.38%	High
Y4		Organizational Work-Environment	3.5208	1.40414	70.42%	High
Y5		Social Relations	3.5417	1.80563	70.83%	High

Y		Functional Stress	3.5786	1.46816	71.57%	High

Testing the Effect of Human Engineering in Reducing Functional Stress:

In this part of analysis, the researchers try to analyze the simple and multi-linear regression with the F-Test application to test the hypotheses of Human Engineering effect with its four axes since they are the independent variable in reducing Functional Strain which is the dependent variable. Accordingly, the test result will be the acceptance of the effect hypothesis when the calculated value of F is greater than its scheduled counterpart which is about (4.1709) with immaterial level (0.05) which means accepting the hypothesis at (95%). At the same time, the probability value that equals the calculated F-Value is smaller than (0.05).

The main hypothesis states that (There is an abstract effect with statistical significance of Human Engineering in reducing Functional Stress). Four sub-hypotheses are derived from this main one which are as follows:

-First Minor Hypothesis states:
There is an abstract effect with statistical significance of the physical work-environment in reducing Functional Stress.

-**Second Minor Hypothesis states**:
There is an abstract effect with statistical significance of control and risk prevention in reducing Functional Stress.

-**Third Minor Hypothesis states**:
There is an abstract effect with statistical significance of teaching and training in reducing Functional Stress.

-Fourth Minor Hypothesis states:
There is an abstract effect with statistical significance of professional health and safety management in reducing Functional Stress.

Table 6 shows that all the minor hypotheses that are subdivided from the main hypothesis have all been accepted. The calculated F-Values for them have been (43.80, 55.23, 56.76, 32.08) respectively, and they are all immaterial, while the Restriction-Factor Values for (physical working environment, control and risk prevention, teaching and training, professional health and safety management) have been (59.3%, 64.8%, 65.4%, 51.7%) respectively. This indicates the explanation percentage of each axis of the Human Engineering respectively for the dependent variable concerning the reduction of Functional Stress.

Table 6: Testing the hypotheses of the effect of the four Human Engineering axes in reducing Functional Stress

Hypothesis		Variables		Type of Statistical Analysis used	Alpha	Bita Regression Coefficient	R2 %	F-Test		Researchers' Comment
		Independent	Dependent							
Minor	First	physical work- environment	Reduction of Functional Stress.	analyze the simple linear regression	0.864	0.705	51.7%	32.08	0.000	Accepting the first minor hypothesis emerged from the main one at 95%
	Second	control and risk prevention	Reduction of Functional Stress.		1.129	0.704	65.4%	56.76	0.000	Accepting the second minor hypothesis emerged from the main one at 95%
	Third	teaching and training	Reduction of Functional Stress.		1.308	0.662	64.8%	55.23	0.000	Accepting the third minor hypothesis emerged from the main one at 95%

	Fourth	**professional health and safety management**	**Reduction of Functional Stress.**		**1.511**	**0.597**	**59.3%**	**43.80**	**0.000**	**Accepting the fourth minor hypothesis emerged from the main one at 95%**
Accepted Hypotheses	**The Number**									**Four Immaterial "abstract" hypotheses among four other ones**
	The Percentage of the Accepted Hypotheses Number									**100%**
The Scheduled F-Value at a trust level 95% which equals (4.1709)										

According to Amos Statistical Analysis Program- Results, table No. 7 and figure No. 6 reveal the acceptance of the main hypothesis "There is an abstract effect with statistical reference of the Human Engineering in reducing Functional Stress" with certainty percentage at 95%, and through using the Multi- Linear Digression Analysis for showing the effect of Human Engineering axes "previously mentioned" in reducing Functional Stress. The calculated F value has been (32.799) and it is also abstract since it is higher than the scheduled F value which is about

(2.7278) at an abstract level at about (0.05), let alone the probable value (indication level) that is equivalent for the calculated F value has been (0.00) which is smaller or lower than (0.05). The value of R2 % has been (82.9%) which indicates the explanation rate of all the Human Engineering axes for the variable that expresses the reducing of Functional Stress. This makes the formula of the Multi-Linear Digression, that expresses the Effective Linear Relation of all Human Engineering axes (physical working environment, control and risk prevention, teaching and training, professional health and safety management) symbolized as follows (X1, X2, X3, X4) respectively in reducing Functional Stress which is also symbolized as (Y), to be as follows:

Y=0.184 X1 +0.240 X2 + 0.331 X3 +0.148 X4

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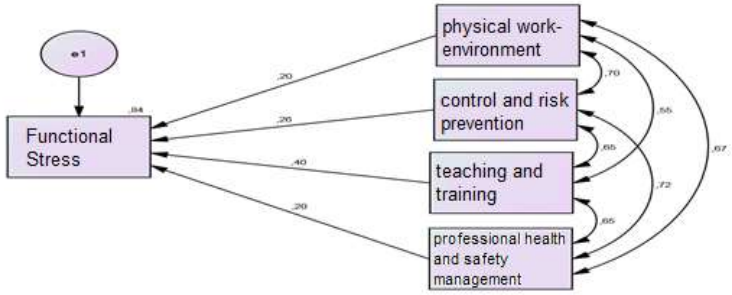

Figure No. 6: The nature of the effective relation of Human Engineering Axes in reducing Functional Stress

Table 7: effect of Human Engineering axes "previously mentioned" in reducing Functional Stress

Hypothesis	Variables			Analysis Type	Alpha	Regression Coefficient	Selection Coefficient	F-Test		Researchers' Comment
Main	Independent		Dependent	Multi-Linear Regression Analysis	0.386	0.184	82.9%	Calculated F Value	Probable Value	Accepting the main hypothesis with a trust percentage at 95% i.e. there is an effect of Human Engineering in reducing Functional Stress
	Human Engineering	Physical working environment	Reducing Functional Stress			0.240		32.799	0.000	
		Control and risk prevention				0.331				
		Teaching and training								
		Professional health and safety management				0.148				
The scheduled Value at a trust level 95% which equals (2.7278)										

The whole previous analysis shows that Human Engineering has an effective role in reducing Functional Stress throughout its axes (physical working environment, control and risk prevention, teaching and training, professional health and safety management) but with different rate of influence for each.

Fourth Part

First: Conclusions

1-Description and Identification of the Independent Variable "Human Engineering

Depending on the descriptive analysis, Human Engineering variable has got good attention by the College of Administration and Economics/ Mustansiriyah University. Its relative importance has been 71%.What cooperates in this importance is the greater attention given to (physical working environment) than to any other axes. This indicates a defect in the attention given by the college, under study, to Human Engineering elements or axes i.e. the attention that may lead to create homogeneity among employees according to their personal muscular and mental characteristics and their working environment in general.

2-Description and identification of the Dependent Variable "Functional Stress"

The descriptive analysis of the Functional Stress variable has revealed the general rate of Functional Stress-consciousness of staff members who have administrative positions has been (17.57%) which is regarded very high, a matter that indicates that the majority of teachers' suffering emerges from their being over loaded with tasks and duties in a way that exceeds their abilities, let alone the weak social substantiation and information introduced by their colleagues that may make them feel relax and low equity of the organizational policies followed.

3-Conclusions related to the effect relations between the two variables of the research

Test-Conclusions have shown that there is an immaterial effect of Human Engineering in reducing Functional Stress. This indicates that the college, under study, has made use of the change occurred in Human Engineering in making additional changes in Functional Stress. This may be due to the great attention given to (control and risk prevention and teaching and training) elements more than that given to (professional health and safety management and physical working environment) ones whose effect has been very slight in reducing Functional Stress as being a behavioral, organizational and social phenomenon resulting from people's interaction with their environment. In order to reduce it, an equal attention to all axes or elements of Human Engineering must be given to reduce Functional Stress and its effects.

Second: Recommendations

1-The college, under study, must support the Human Engineering Application-Process though designing everything that may increase the staff members' performance of their tasks, and concentrate on all Human Engineering elements as one unit, rather than separately, focusing on making their effect in reducing Functional Stress.

2-It is necessary to found a Human Engineering Unit in the college that supervises on the application of rules in order to provide health and safety for all staff members and protects them from everything that may influence their mental and muscular abilities and qualifies them using various remedial ways.

3-Since the statistical results of the research have indicated a weak effective relation of (professional health and safety management, physical working environment) in reducing Functional Stress as compared with the other elements (control and risk prevention, teaching and training), this requires the following:

a-As a part of the Human resources duties in college, it is necessary to develop awareness and pledge of applying the safety and health instructions, and punish those who may not follow these instructions.

b-Identifying the present and probable problems in working environment that may cause Functional Stress.

4-Remediation the phenomenon of Functional Stress through paying close attention to its causes whether they are personal or related to the work itself.

5-Handling the severe stresses the staff members may be exposed to as a result of incorrect or unsafe behaviors and actions in their work or the unavailability of the supporting aids for achieving the work.

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Mustansiriyah University.

College of Administration and Economics

Business Administration Department

Re.: Questionnaire Adjudication

Dear Sir

We would like to present this questionnaire as a part of the requirements for the research entitled "The role of Human Engineering in reducing Functional Stress"-an analytic study on a sample of university instructors who have administrative positions in the college of Administration and Economics-Mustansiriyah University.

We would be very grateful if you signal one of the options given in front of each item in a way that suits the actual status of the Department you work in. We would be very thankful for your help, and are expecting your objective answers, a matter that will help in accurate

analysis and results. It is worth mentioning here that the data are used for the purpose of scientific research only.

Your scientific and accurate answers will be a main factor of results-validity. Your answers will be scientifically, accurately and secretly treated.

Researcher Researcher Researcher

First: Personal Information:

1-Gender: male female

2-Age: 30 and less than 31-40 41-50 51 and older

3-Educational level: MA PhD

4-Working position: vice dean Head Dept. Dept. determinant

Branch Head unit Head Committee Member

5-Years in Service: less than 5 years 5-15 16-20 21 and

More

6-Number of training courses related to the work: inside Iraq outside

Iraq

Second: Human Engineering: A framework for a work system that describes the analysis level for human, machine and environment

No.	Items	Totally disagree		disagree	Neutral	agree	Totally agree
	Professional working environment						
1	Pay attention to the harmony between work-nature and requirements of tasks-achievement.						
2	College administration seeks to make all staff members perform various activities taking into account the physical status of them						
3	The tasks suit the persons' qualification levels						
4	Office design and equipment-distribution help in performing the work-tasks						

	easily						
5	College administration prepares a wide place for movement according to work requirements						
	Control and Risk Prevention						
6	Control and risk prevention is regarded as an initial step for improving work-places						
7	College administration seeks to identify the improvement areas or their probable aspects						
8	Data related to professional and working disease and injuries are already collected						
9	College administration follows a valid or correct scheme of the safe procedures to guarantee the worker's safety						
	Teaching and Training						
10	Developing the members' performance of the work they occupy is achieved through planned training						
11	The members are actively able to apply administrative concepts and disease prevention						
12	The members acquire skills that help them improve quality, minimize mistakes and perform their work accurately and correctly from the very beginning						
13	College administration insists on the existence of a person who has the ability of designing Human Engineering programs, give advice and guidance to managers, supervisors and personnel						
	Professional Health and Safety Management						
14	College administration insists on the availability of						

	a safe working environment through paying close attention to professional health and safety						
15	College administration follows the laws that regulate work accidents and compensation						
16	College administration follows and depends on various protection procedures to reduce work damages						
17	Protecting personnel from accidents and diseases of work is an essential duty of Human Resources Management						

Second: Functional Stress: is the collective effect of stresses that is mainly represented by deviation of the normal state due to being exposed to stressful accidents.

	Role Characteristics					
18	College administration depends on functional description which includes duties, responsibilities, work-conditions and tools used					
19	A worker may find himself in a contrast with work requirements assigned to him					
20	A worker is ordered to perform roles or tours which are against his values and tendencies					
	Work Nature					
21	A worker is assigned to perform roles or actions that exceed the time limits assigned to finish these roles					
22	A worker is given duties and responsibilities that suit his abilities and skills					
	Organizational structure					
23	College administration is the center of decision making					
24	A worker's opportunities of promotion are decreasing as the worker gets order					
25	The work suffers from a shortage in tools and equipment					

26	The managerial procedures inside the college are regarded as a waste of time					
27	Communication channels are weak in the delivery of information among the organizational levels					
	Organizational working environment					
28	College administration follows fair policies as far as wages and rewards are concerned					
29	Workers feel that their performance is fairly and objectively assessed					
30	Workers have the opportunity to communicate with the top president of the work to discuss work issues					
	Social Relations					
31	A worker is socially supported by his colleagues					
32	Good social relations in work-place ease the worker's feeling of tension and anxiety and help him get rid of frustration					
33	A worker feels psychological relief throughout the help and information he gets from his colleagues					