

The Psychological Effects of Exercise on Perceived Stress in Athlete Staff: Presenting a Theoretical Model

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Abstract

Background: The study is intended to examine a model of direct and indirect effects (through mediating role of self-assessment latent variable containing self-efficacy and self-esteem components) of sports mental toughness construct (including the components of confidence, consistency and control) on perceived stress of athlete employees.

Method: The research design of study was correlational and its approach was structural equations. The population were all athlete employees at National Iranian Gas Company (NIGC) 400 of whom were selected with simple random method. The applied instruments were reliable and valid. Data analysis was performed using macro program of Preacher and Hayes in SPSS-19 software and also using AMOS-20 software.

Results: The results indicated that the direct path of the proposed model should be eliminated and after eliminating this path, the model's fitness parameters were optimized.

Conclusion: According to the data of this research it can be concluded that one of the mechanisms of sport's impact on perceived stress of employees is that first, it influences the three aspects of sports mental toughness and then, a mixture of these variables' effects improve this employees' perceived stress through increasing the self- assessment construct of them (and its components).

Introduction

Stress has attracted the attention of scientists from various scientific disciplines. Physicians, psychiatrists, physiologists, and biologists examine some aspects of this issue. The use of the term "stress" dates back at least to the fourteenth century, which had been used in different ways (1). The psychological aspect of this construct has been considered with regard to stress in humanities and behavioral sciences research. On the other hand, due to some problems with its objective appraisal,

most current theories emphasize that perceived stress rather than stress should be evaluated (2).

Evaluation of stress in the organizations and workplace is becoming increasingly important, because current organizations need to continually increase their organizational performance in order to prevent bankruptcy. For this purpose, the most important factor in the organizations is human resources or employees (3). This issue demonstrates the significance of employee's stress. Indeed, high levels of

negative stress or distress and low levels of health among employees result in the gradual decrease in productivity and ultimately the collapse of the organization (4). According to a report by California Workers' Compensation Institute, the number of work-related stress claims increased by almost 700% between 1979 and 1988 (5). According to one of the most recent definitions, stress occurs in the workplace when various demands of the organization are not matched with its employees' abilities, capabilities, and desires (6). In other words, the lack of coordination between the organization expectations from employees, on the one hand, and employees' interests and desires, on the other hand, result in stress among employees. It seems that the main determinants of individuals' perception of stress are their views on their personal, family and occupational conditions. On the other hand, perceived stress among employees means that their occupational condition and even their lives are mentally stressful and suffering (7). Therefore, in order to improve the employees' performance, intervention methods should be employed in the organization to reduce their perceived stress and improve their health.

Although, many studies have investigated the causes of stress among employees, but there is no consensus among researchers on the best way to fight against stress in the workplace (8, 9). So, while there are many ways for effective control of stress in the workplace, exercise is believed to be a great mechanism in this area (10). In fact, exercise has been identified as the most effective intervention for work-related stress (8).

Ritvanen et al., investigated the effects of aerobic fitness on physiological stress responses among 26 subjects during working hours through the Visual

Analog Scale (VAS). They found that a high level of physical fitness may reduce muscle tension and increase employees' morale at work (11). It was also found that immediately after completing a training program, stress and anxiety can be gradually and easily reduced in stressful people (8).

In spite of the above mentioned evidences regarding the beneficial effect of exercise on stress among athlete employees and also the superiority of athlete employees to non-athletes in terms of health and its related factors (12-13), few studies have investigated the cause and mechanism of these beneficial effects in athletes. In other words, previous studies showed that athletes are psychologically superior to their non-athlete counterparts, but did not exactly specify which psychological factors and determinants play a major role in this superiority. Therefore, current research seek to investigate the psychological factors and psychological changes that occur in athletes and lead to their mental superiority.

For this reason, the present study aimed to find psychological factors which can indicate the desired effect of exercise on the perceived stress among athlete employees. According to the previous research in this field, exercise can activate mental components in employees, which empower them against pressures of life, and empower them so as not to lose their initiatives in difficult situations (14).

These psychological areas have already raised an increasing interest in sport and occupational research (15), and create a structure called mental toughness. Mental toughness, in one of the most comprehensive

and practical definitions has been described as a set of intrinsic and developed values, attitudes, emotions, and general and specific cognitions, which affect the way that a person positively or negatively respond to pressures, challenges or hardships (16).

This structure was initially presented in sport by Clough, Earle and Sewell, and then it was developed specifically among athletes by Sheard et al, (17) therefore, athletes and coaches working with sports psychologists often tend to be psychologically strong enough to overcome the barriers and difficult conditions on their path to success. The structure presented by Sheard et al as C3, consisted of three components: confidence (the belief of athletes about their ability to achieve goals and to be better than the competitor), consistency (reflects intention, personal responsibility, strong attitude and the ability to concentrate), and control (the perception that a person has the power and influence and can bring about the desired outcomes by controlling the emotions) (17).

Although in the previous researches, sport mental toughness has been less widely investigated, but some studies showed that mental toughness can act as a

psychological mechanism in the relationship between exercise and health (15, 17- 18).

Therefore, it can be assumed that one of the sports psychological factors in athlete employees which affects and improves their perceived stress is the promotion of sport mental toughness and its components- confidence, consistency, and control.

In the other side, there is some evidence which depicts the issue of people's mental toughness as a powerful predictor of the variables related to their self-assessment including self-efficacy and self-esteem (19-21) and moreover, these variables have a significant relationship with employees' stress (22-26). Therefore, the other hypothesis is that sport mental toughness of athlete employees affects their self-assessment factors, and indirectly improves perceived stress among them.

In short, the main aim of this study is to examine direct and indirect effects of sport mental toughness of athlete employees on perceived stress by them. The indirect effect of sport mental toughness of athlete employees was investigated by mediating effect of self-assessment. The hypothesized model in this research is presented in Figure 1.

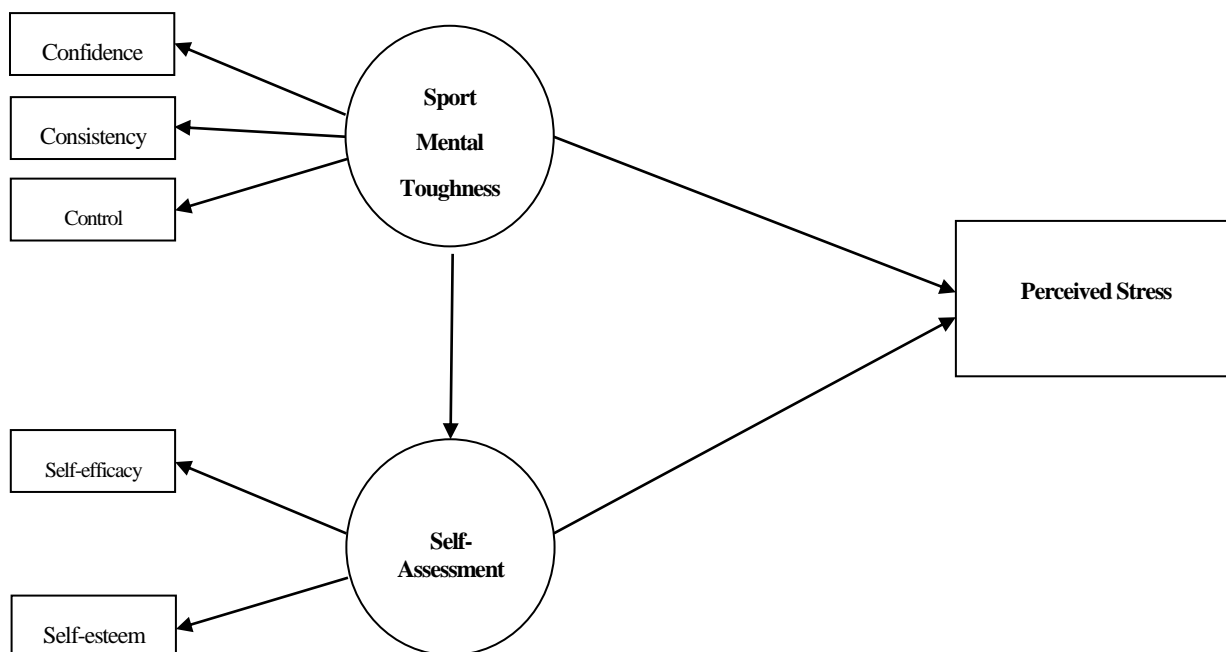


Figure 1. The proposed model of the study

It is worth mentioning that according to the current research, the model presented in this study was investigated for the first time. Also, most of the previous studies have been relational or comparative and less relevant to the athlete employees. The main advantage of conducting such research on athletes is that they can be used to improve the views of organizational personnel (especially non-athletes) on the psychological values of exercise, and to expand systematic and targeted exercise programs in the organization.

According to the study of Satterwhite (27) on 67 athlete students, mental toughness has a direct relationship with stress, and also, it can have an indirect impact on their stress through mediating effect of general self-efficacy and grit. In another similar study on 140 IT specialists, Subramanian and Vinothkumar showed that hardiness with the mediation effect of self-esteem affected work-related stress among them (28).

Materials and Methods

The design of this research is correlational, through structural equation modeling. The research population included all employees ($n=22000$) of National Iranian Gas Company (NIGC). Employees who performed exercise program for at least six months, and had a medium to high interest in continuing exercise program were defined as athlete employees. According to the above definition, athlete employees are the individuals who are currently promoted to the action, maintenance, and termination stages of the Transtheoretical model (29). Some researchers believe that in addition to the above criteria, athlete personnel are the people who perform an exercise program at least twice a week and for at least 150 minutes/week. A short questionnaire titled "Employee Sports History" was designed by the researchers to examine the above criteria in individuals. Those who had reached standards equal to or above those mentioned above (the least level of four criteria including exercise duration,

interest in performing exercise program, the number of exercise session per week and exercise duration per week) were selected as athletes.

Given that the exact number of athletes on the basis of the above mentioned criteria was not clear and only the approximate total number of employees was available, the minimum sample size was determined 379 using Krejcie and Morgan Table. In order to ensure obtaining of the required sample size, the questionnaires were distributed among at least 600 employees. For this purpose, the questionnaires were randomly distributed among 600 employees. After screening the questionnaires based on the four above- cited criteria, it was revealed that 400 employees were athletes.

Sport Mental Toughness

To collect information about sport mental toughness of athlete employees, the Sport Mental Toughness Questionnaire (SMTQ) presented by Sheard et al was used. The SMTQ is comprised of three components (confidence, consistency and control). It contains 14 items, the first six items measure confidence, the second four items measure consistency, and the last four items measure control. Each item is scored on a 4-point Likert scale (1= very untrue to 4= very true) (17). In the study of Sheard et al, the reliability coefficient of this questionnaire for the three components of confidence, consistency, and control were 0.80, 0.74 and 0.71, respectively, and its validity was confirmed through exploratory and confirmatory factor analysis (17). In another study, the reliability of its subscales by the retest method varied between 0.78 and 0.85 and by the Cronbach alpha coefficient varied between 0.73 and 0.83 (30).

General Self-efficacy Scale

General Self-efficacy Scale (GSE) is a 10-item scale presented by Schwarzer et al. The Cronbach Alpha coefficient of this scale has been reported desirable in many different countries. Schwarzer et al., reported that the validity of GSE in correlation with optimistic attribution style in a group of students was 0.49 and with perception of challenge in stressful situation was 0.45 and with self-regulation in teachers was 0.58 and all of the coefficients were statistically significant (31). The reliability of 0.83 and validity of 0.56 for this tool has been also reported (32).

Self-Esteem Scale

Self-esteem is measured by Rosenberg 10-item Self-Esteem Scale. The reliability of this scale was reported 0.76 in the study by Gentile et al (33). In addition, its validity was evaluated by the confirmatory factor analysis (CFA) and its factor loadings were reported in the range of 0.61 to 0.87 (33). Ghafouri et al also reported the Cronbach alpha coefficient of it about 0.76 (34).

Perceived Stress Scale

Perceived stress is measured by perceived stress scale (PSS) presented by Cohen et al. The PSS was designed to help respondents express their opinion on the uncontrollability, unpredictability and hardship of their lives. Its original version contains 10 items but there are also its 4-item and 10-item versions.

Data Collection and Analysis Method

Following the negotiations and required letters to the sports and research agents of the NIGC, necessary

explanations about the objectives and field of the research were given to the employees and the scope of the problem was presented. Then, the questionnaires with instructions were distributed among employees. The proposed model was analyzed using SPSS version 19 and AMOS version 20. The mediating effect of the model was evaluated using Bootstrap in macro program by Preacher and Hayes.

Results

Before the main analysis, a few initial analyses were performed to obtain preliminary insights on the research data, and the mean, standard deviations and simple relationships between the four variables were investigated.

Table 1 shows the mean, standard deviation, and simple correlations between the variables. Most of the relationships are significant at significance levels of 0.01 (Table 1). These statistical correlations between the variables provide an overall understanding about the results of the research.

Table 1. Mean (M), standard deviation (SD), and correlation matrix between the variables of the model

	Variables	M	SD	1	2	3	4	5	6
1	CF	19.093	2.9						
2	CT	11.220	1.8	**					
				.527					
3	CS	39.822	2.3	**	**				
				.294	.531				
4	SMT	39.822	5.6	**	**	**			
				.820	.821	.736			
5	SEF	31.779	3.4	**	**	**	**		
				.504	.477	.437	.600		
6	SES	23.367	3.4	**	**	**	**	**	
				.438	.430	.404	.536	.583	
7	PS	21.997	4.8	**	**	**	**	**	**
				-.372	-.424	-.411	-.502	-.547	-.500

** $\alpha < 0.01$ (Notes: CF: Confidence, CT: Control, CS: Consistency, SMT: Sport mental toughness, SEF: Self-efficacy, SES: Self-esteem, PS: Perceived Stress)

Review of the Hypotheses of the Model

Before examining the structural coefficients, the model fitness was investigated. Although the values of most of the fitness indices displayed acceptable model fitness, the root mean square error of approximation (RMSEA) showed that the model needs to be improved. For this purpose, the removal of a non-significant path (path of the direct effect of sport mental toughness on perceived stress) was recommended by AMOS-20. After removal of this non-significant path, the RMSEA of the model was improved and reached a significant level of 0.07.

According to the findings of structural equation modeling, the coefficient effect of sport mental toughness on perceived stress was -0.60, thereby, 36% of the variance of perceived stress was explained by the final model. The results of fitting the model are presented in Table 2, and the final model with standard coefficients of the paths is presented in Figure 2. It should be noted that in this table the values of GFI, CFI, TLI, IFI, NFI indices should be higher than 90% and the RMSEA index should be below 1, so that the relevant model has significant statistical fitness (For more information, see 37).

Table 2. Fitness indices of the proposed and final modified models

Fitness Indices	χ^2	Df	χ^2/df	GFI	IFI	TLI	CFI	NFI	RMSEA
Proposed Model	36.77	7	3.74	0.97	0.96	0.92	0.96	0.95	0.10
Final Model	36.33	8	3.02	0.97	0.97	0.95	0.97	0.96	0.07

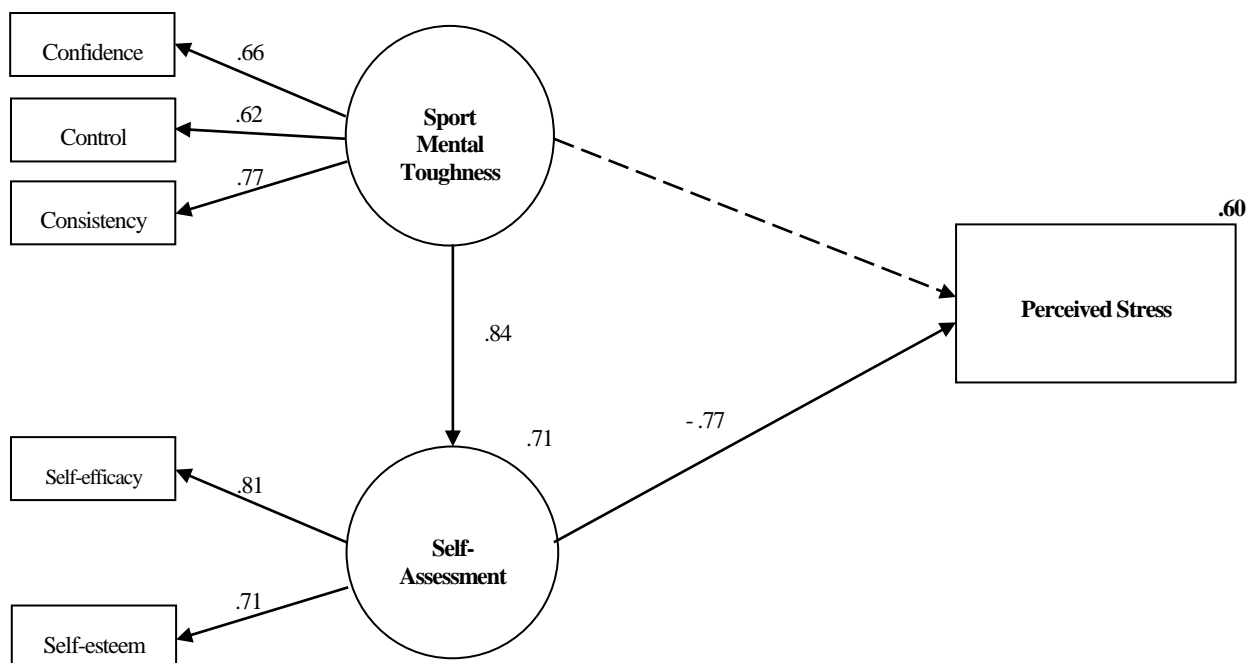


Figure 2. The final model of the study and standardized coefficients of the directions

The path coefficients show that all direct paths except the path of direct effect of the sport mental toughness on perceived stress were significant (Figure 2). Thus, the first hypothesis of the research was not confirmed. The results of the mediating effect using Bootstrap are presented in Table 3.

The path presented in Table 3 indicate that zero number has not been included at this distance, therefore, the second hypothesis was confirmed. The confidence interval was 95 and the number of samples by Bootstrap resampling was 5000.

Table 3. The results of bootstrap approach for the mediating path of the study's model

Path	Data	Boot	Bias	SE	Lower limit	Upper limit
Indirect path through Self-Assessment construct	-.25	-.25	-.0003	-.03	-.32	-.18

The data column indicates indirect standard coefficient, and the upper and lower limit columns indicate its significance.

Discussion

The findings of this study showed that sport mental toughness (confidence, consistency, and control) had no direct effect on perceived stress, which is inconsistent with previous studies (15,17,18,20,21,27,28). Discrepancy between the findings of studies may be explained by this fact that the effect of exercise on employees' health is likely more complicated to be investigated by merely a simple relational or comparative study.

In other words, previous researches were more likely performed to indicate a relationship between improving mental toughness (and its components) and improving the health aspects such as perceived stress by employees, or to show that mental toughness and health conditions of athletes are more favorable than non-athletes. But according to the available evidence, no study has been performed to answer the question of whether other variables may have a mediating effect in this relationship or not. Therefore, this research was performed to investigate the direct and indirect effects of sport mental toughness on stress among athlete employees to determine whether direct effect of promoting sport mental toughness on perceived stress is more pronounced or its indirect effect.

As a result, the second hypothesis of this research on the basis of mediating effect of self-assessments in the relationship between sport mental toughness and perceived stress among athlete employees was examined and confirmed, which is consistent with the other studies (20, 21, 27). In addition, in other research, there are similar concepts to mental toughness such as mental resilience and hardiness that are not related to the field of employees' exercise, but they can indirectly support the findings of this study (29, 35, 36).

However, according to the findings and definition of the three components of sport mental toughness (17), it was found that exercise provides a situation for employees to acquire empowerment views, consistent responsibility and a sense of mastery on internal and external events (and in general, an integrated attitude to psychological adaptability and flexibility) to gradually believe that they are valuable and have different useful capabilities for the organization. As a result, exercise can help employees, in the long run, to reduce their destructive stress, to promote their positive and constructive stress, and to be transformed into extraordinarily useful individuals (in terms of efficiency and effectiveness) in the organization (2).

Conclusion

Findings of the study presented that the direct effect of sport mental toughness of the athlete employees on their perceived stress was not approved and it is better to accept that this effect first leads to increased self-assessment (or a combination of the beliefs about self-efficacy and self-esteem) in employees, and finally, improves their perceived stress. Therefore, the direct path was removed in the final model of this study. Thus, it is concluded that the psychological impact of exercise on health aspects of employees is likely to be long-term and by activation of variables that lead to better empowerment, self-confidence and self-assessments in them, and so, employees' resistance against negative effects of perceived stress would be increased, and a context for their growth would also be provided.

Limitations and Recommendations

A. Due to lack of electronic questionnaires and guidelines for completing such questionnaires, the main executive of this study used printed questionnaires, therefore, more time and energy were consumed for collecting data. Furthermore, some employees did not complete questionnaire or left them half-filled due to their mission. It would be better to create opportunities in the organizations and companies through which the employees use a computer program, download an electronic questionnaire or receive it through e-mail, and complete it at home or work. Of course, this method in the organization may have some challenges such as the need of training employees to learn how to fill electronic questionnaires, but this method has also various advantages, like protecting confidentiality of subjects identification, consequently, more cooperation of subjects, and spending less time and cost to access a higher volume of completed forms by the samples with different situations (different workplaces, life, culture, organizational conditions, social norms, etc.). Therefore, it increases the validity of the research results, facilitates data entry and analysis of the results of the study.

B. Neither the present study design nor the use of structural equation modeling prove causality. It is believed that although the use of structural equation modeling approach

helps to reach scientific inferences, it is necessary to be more cautions in this regard (37). Future research is better to use a pilot project that examines the present model and even more comprehensive models for evaluation of the relationship between exercise and employees' mental toughness and perceived stress.

C. Due to lack of time and administrative constraints of the NIGC, cross-sectional design was used in this study and longitudinal study design was not possible, thereby, drawing conclusions about causation was difficult. To generalize the results of this research, it is recommended to investigate athlete employees at different levels of skill and age. In addition, more comprehensive models in this field are required to be designed and used in the longitudinal studies because a longitudinal study can support the effects investigated in this study. The other advantage of this type of study is that the data extracted from a longitudinal study can be compared and correlated over several periods, the relationship (positive or negative) between variables is more simply determined, and the temporary chain of change becomes evident. These are the benefits of longitudinal investigations which are not found in cross-sectional research (8).

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