Original Research

The Relationship Between Resilience and Injury, With the Mediating Role of Intrinsic and Extrinsic Motivation Among Runners

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Abstract

Background: The present study was conducted with the aim of determining the relationship between resilience and the incidence of injury through the mediation of internal and external motivation of runners.

Methods: The research method was descriptive-correlational. The statistical population included all the running athletes in 2021, of which 235 people were randomly selected as the research sample. To collect data, Connor and Davidson's (2003) resilience questionnaires and Playter's (1995) sports motivation and questions about having an injury in the last 12 months were used, and the data were analyzed by Pearson's correlation and path analysis.

Results: The results showed that there is a negative and significant relationship between resilience and intrinsic and extrinsic motivation with the incidence of injury. The results of the path analysis using the bootstrap method also showed that the internal and external motivation variables play a mediating role in the relationship between resilience and injury occurrence in runners and the presented conceptual model has a good fit. These findings suggest two pathways through which resilience can prevent injury in athletes.

Conclusion: This study shows that runners with a high level of motivation and resilience are associated with a lower number of injuries

Keywords: Damage, Internal and external Motivation, Resilience

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Introduction

Running is one of the sports that is used in the adult population all over the world due to the sustainable costs of technical materials and its many beneficial effects on health. Caring about lifestyle, diet, fitness, and competitive sports promoted by the media over the past decade has led to a dramatic increase in physical activity levels and interest in competitive and recreational sports. Although evidence shows that running is one of the most effective ways to achieve health and fitness, recent studies show that it also carries a relatively high risk of associated injuries. Approximately 80% of running-related injuries are due to overuse, resulting from an imbalance between the resistance capacity of the connective tissue and the biomechanical load of running (1). Resilience is a concept that has shown increasing importance in the field of sports in recent years. Although there are different definitions of resilience, most theories describe it as a psychological trait, which promotes positive adaptation in the face of adverse processes or adverse periods. Resilience integrates cognitive and emotional components with capacities and behaviors that allow for healthy behaviors and positive responses to illness, disability, and adversity (2). Resilience is a kind of general capacity that is used to prevent, minimize and overcome problems. Resilience shows the ability of a person as a protective factor and a tool for positive growth, and is more emphasizing on recovery from negative events than invulnerability to stress(3). Resilience can be described as the ability to get out of difficult situations or to adjust those conditions, in fact, resilience expresses the capacity of people to stay healthy and resist and endure in difficult and risky situations that a person who not only overcomes difficult situations, but also becomes stronger during and despite them. So resilience means being successful, living and developing oneself in difficult conditions [4]. People who have low or weak resilience, and instead of looking for a logical solution, avoid those situations by denying and avoiding them, they will surely experience such occupational, family, economic and personal disturbances. But people who have high resilience, although they consider the aforementioned conditions as threatening conditions, but they try to use the existing conditions in an efficient way by adopting logical solutions [5]. As sport is an institutionalized activity that requires the application of physical force using complex physical skills, there is a growing interest in running as an activity and is one of the most popular forms of sports participation in Western Europe. The health-oriented approach is characterized by its popularity and accessibility, because there are few economic conditions or special infrastructure to do it and it can be done anywhere and anytime [6]. Physical activity is generally associated with improved physical and mental health. Despite its association with various health-related aspects, athletes may experience adverse outcomes, including injuries [7]. Several studies associate the incidence of sports injuries with some psychological characteristics such as stress, resilience, etc. [2]. Experience teaches us that there are two ways to enjoy an activity, internally and externally. In fact, any activity can have internal or external motivational bias. If a person engages in an activity that has no purpose other than performance, he participates in that activity with an internal motivational bias; If he does an activity to satisfy motives unrelated to the activity, he participates in it with an external motivational bias. When people are intrinsically motivated, they act simply because of the experience that is the task itself [8]. Motivational aspects have been among the aspects analyzed in the personal factors of athletes and have been associated with several variables including motivations for participation, resilience and performance in endurance competitions and more on internal and external motivation. The positive effect of motivation on the health status of runners has also been shown [9] and motivation has been analyzed as part of the psychological factors that influence the decisions

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made by athletes to return to training and competition after injuries [10]. In addition to all these cases, resilience research in sports environments is mainly focused on competitive athletes of different sports in search of improved performance by individuals [11] and teams [12] and how resilience is related to contextual factors [13]. Current trends agree that resilience is a multifactorial and very complex concept, which has recently been linked to injuries in athletes. Considering the provided explanations, as well as the importance of motivation and resilience in track and field, which possesses a high chance of injury, this research aims to answer the question of whether resilience and the occurrence of injuries among runners are related to the mediation of internal and external motivation.

Methods

The present research is among the types of basic, applied and developmental researches, in terms of the objective, among the applied researches. Also, in terms of method, this research is descriptive and among the types of descriptive research, it is among correlational research. In terms of data collection time, it is a one-time research. The statistical population in this research was all track and field athletes of Tehran in 1400. To collect data, Connor and Davidson (2003) [14] endurance questionnaire Playter (1995) [5] sports motivation questionnaire and researcher-made sports injury questionnaire were used. SPSS software was used for data analysis, and Lisrel software version 23 was used to test the presented conceptual model and to analyze the relationships between variables in the structural and measurement model.

Results

In the following table, the statistical indicators including mean, variance and standard deviation and the highest and lowest research variables are presented. According to table (1), the average score for resilience is 90.89±17.31; for internal motivation: 46.19±13.31; for external motivation 55.53±17.15; 0.43±0.26 was obtained for injuries. Skewness and kurtosis of all variables are between +2 and -2. The skewness value of the variables is divided by their standard error, and if it is estimated between ±2.58, the condition of normality of the variables is met (Tabaknik, Fidel and Ullman, 2007). Considering that the skewness and elongation of all research variables are between -2 and +2; Therefore, based on the opinion of Tabaknik et al. (2007), the data distribution is considered normal. Before testing the relationships between the variables, it is necessary to check the normality of the variables. One of the methods of checking the claim of normality of variable distribution is to use the Kolmogorov-Smirnov test. The results of this test are presented in the table below. The results of this test show that the significance level of the research variables is more than 0.05 and it should also be noted that Spss software has recognized the results of this questionnaire as normal according to the central limit theorem, so the null hypothesis that the variables are normal is confirmed. The correlation coefficient shows the intensity of the relationship as well as the type of relationship (direct or inverse). This coefficient is between 1 and -1 and is equal to zero if there is no relationship between two variables. This test examines the relationship between two variables according to the following assumptions. The way of judging the presence or absence of communication is based on the obtained significance level. Thus, if the sig of the test is less than 0.05, the hypothesis H0 is rejected and there is a significant relationship between the two variables. According to table (4); As can be seen, the Sig of all relationships is equal to (0.00), which is less than (0.05). Therefore, the statistical null hypothesis (H0) that there is no relationship between the variables is rejected. The table below shows the results of Lisrel's outputs in the standard and meaningful mode and the results of hypothesis number 1 of the research. In the first hypothesis of the research, it was claimed that resilience has a direct relationship with the occurrence of injuries among runners, which the statistical analysis between the two shows according to table (5); The significant number of the path between two

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variables is greater than 1.96, so this hypothesis is confirmed. On the other hand, since the obtained significant number is positive. This effect is direct. The table below shows the results of Lisrel's outputs in the standard and significance mode and the results of hypothesis number 1 of the research, briefly. In the second hypothesis of the research, it was claimed that resilience has a direct relationship with internal motivation among runners, which the statistical analysis between the two shows according to table (6). The significant value of the path between two variables is greater than 1.96, so this hypothesis is confirmed. On the other hand, since the obtained significant number is positive. This effect is direct. The following table briefly shows the results of Lisrel's outputs in standard and significance mode and the results of hypothesis number 3 of the research. In the third hypothesis of the research, it was claimed that internal motivation has a direct relationship with the occurrence of injuries among runners, which the statistical analysis between the two shows according to table (7). The significance value of the path between two variables is greater than 1.96, so this hypothesis is confirmed. On the other hand, since the obtained significant number is positive. This effect is direct. The following table briefly shows the results of Lisrel's outputs in standard and significance mode and the results of hypothesis number 4 of the research. In the fourth hypothesis of the research, it was claimed that resilience has a direct relationship with external motivation among runners, which the statistical analysis between the two shows according to table (8). The significant value of the path between two variables is greater than 1.96, so this hypothesis is confirmed. On the other hand, since the obtained significant number is positive. This effect is direct. The following table briefly shows the results of Lisrel's outputs in standard and significance mode and the results of hypothesis number 5 of the research. In the fifth hypothesis of the research, it was claimed that external motivation has a direct relationship with the occurrence of injuries among runners, which the statistical analysis between the two shows according to table (9). The significant value of the path between two variables is greater than 1.96, so this hypothesis is confirmed. On the other hand, since the obtained significant number is positive. This effect is direct. The result of the hypothesis test number 6 of the research

The results of direct and indirect communication of research hypothesis number 6 are shown in the following table: According to table (10), it can be seen that since the total beta value of all the variables is more than 0.3, therefore all the hypotheses have been confirmed and it can be concluded as follows:

The sixth hypothesis of the research indicates that resilience with the occurrence of injuries among runners has an indirect relationship with the role of internal motivation among runners, which is due to the fact that the total effect obtained for this relationship was greater than 0.3. Hence, this correlation is favorable and therefore this hypothesis is confirmed. The results of direct and indirect communication of research hypothesis number 7 are shown in the following table: According to table (11), it can be seen that since the total beta value of all the variables is more than 0.3, therefore all the hypotheses have been confirmed and it can be concluded as follows:

The seventh hypothesis of the research indicates that resilience with the occurrence of injuries among runners has an indirect relationship with the role of external motivation among runners, which is due to the fact that the total effect obtained for this relationship was greater than 0.3. Hence, this correlation is favorable and therefore this hypothesis is confirmed.

Discussion

According to the data, resilience has a significant and direct negative relationship with the occurrence of injuries among runners. In addition, the standard coefficient (path coefficient) obtained for resilience and damage was -0.78 at the significance level of 0.0001, and the significant number obtained was 9.34. The results of this research are consistent with the researches of Martin et al. (2021) [15], Ernst et al. (2021) [3]

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and Tinhinan (2020) [16]. Martin et al. (2021) [15] concluded that there is a significant relationship between flourishing and injury status and resilience, as well as between resilience and injury status among athletes. Ernst et al. (2021) [3] stated that low resilience scores were significant predictors of long-term recovery among injury characteristics and risk factors. Psychological resilience is an important factor associated with recovery time after sports-related concussion. In general, researchers have defined resilience as a person's "ability to deal with stress," as well as the capacity to "bounce back" from adversity. In order for athletes to be resilient, they need to develop the interrelated core skills of positive adaptation to variability and the ability to cope with stress.

According to the data, resilience has a significant positive and direct relationship with intrinsic and extrinsic motivation among runners. The results of this research are in agreement with the researches of Mohammadkhani and Momenifar (2019) [17], Saham et al. (2017) [18], Rostami et al. (2021) [21], Bayrakdaroglu et al. (2020) [22], Trigoros et al. (2020) [23]. Mohammadkhani and Momenifar (2019) [17] stated that the findings showed that there are positive and significant relationships between the independent variables of progress motivation and self-efficacy with the dependent variable of resilience. Nascimento et al. (2021) [21] concluded that resilience showed a significant correlation with all controlled and autonomous regulations: extrinsic, intrinsic, identified and integrated motivation. Path analysis showed that this resilience has a significant effect on intrinsic and extrinsic motivation and explains 16 and 11 percent of the variables' variance, respectively. Bayrakdaroglu et al. (2020) [22] concluded that female soccer players had a significant positive correlation between goal orientation and resilience. On the other hand, there is a significant and positive correlation between goal orientation and sports motivation. There is a significant and positive correlation between the average scores of resilience, goal orientation and sports motivation. There is a significant, positive and low correlation between sports motivation and goal orientation.

According to the information, internal and external motivation has a significant direct and negative relationship with the occurrence of injuries among runners. Previous research has supported the relationship between motivation and the theory of planned behavior in numerous health behaviors [12] and has shown particularly in sports-related areas such as sports injury prevention, injury rehabilitation and participation in physical activity.

The effects of motivation on attitudes, subjective norms, and perceived behavioral control were larger than similar effects in the opposite direction, indicating that motivation acts as an antecedent of beliefs consistent with the hypotheses of the integrated model. According to the information, resilience has an indirect effect on the incidence of injury through the mediation of internal and external motivation. The results obtained from the mediation model showed that extrinsic motivation and intrinsic motivation have a positive effect on the relationship between resilience and the number of injuries.

Conclusion

The more resilient athletes are, the better they are able to handle stressful situations, which may provide an explanation as to why these athletes sustained fewer injuries than athletes with lower levels of mental resilience.

Developing resilience (ie, experiencing adversity and adapting positively to that adversity) is an essential step in an athlete achieving high levels of performance. Resilience requires being exposed to failure or (at least the threat of failure) and thus, experiences can help people to be more resilient if they are on the other side of success (failure or circumstances leading to it). It seems that sports activities, especially professional sports, have this feature. People's motivations to participate in sports activities play an important role in determining the type and intensity of sports activities, and knowledge of these motivations can help coaches to find out why people avoid or

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prefer such activities. This issue has caused the attention of mental health practitioners to focus seriously on the antecedents and psychological consequences of exercise. The more motivated athletes are, the less injuries they may experience. This may be due to the fact that athletes who self-determine physical activity put more effort into self-improvement. Previous research has shown how high-performance endurance athletes show a high level of motivation [24], but the higher the performance level of athletes, the higher their capacity to be flexible and cope with stressful situations. It has been found that high performance athletes are more able to face different obstacles in a more effective way.

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Authors Contributions:

MRD conceptualized the study objectives and design. MRD are infectious disease specialists who contributed to data collection from patients along with MRD drafted the study design protocols to be submitted to research centers. Data were was analyzed by MRD. Manuscript was drafted by MRD. All authors contributed in revisions.

Ethical Consideration:

None

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Tables:

Table 1: Descriptive statistics of research variables

Kurtosis	Skewness	Most	Least	SD	Mean	Scales
-0.34	-0.69	120	51	17.31	90.89	Resilience
-0.11	-0.89	77	12	13.31	46.19	Intrinsic motivation
-0.95	-0.59	80	19	17.15	55.53	Extrinsic motivation
-0.78	1.1	1	0	0.43	0.26	Injury

Table 2: Normal distribution of variables

Factor	Kolmogorov Smirnov	Sig.
Resilience	1.026	0.413
Athletic motivation	0.968	0.567

Table 3: how to judge the numerical value of the correlation coefficient

Judgement	Value
Direct correlation - weak	0-0.25
Direct correlation – relatively high	0.25-0.5
Direct correlation - high	0.5-0.75
Direct correlation – very high	0.75-1
no correlation	1
Inverse correlation – weak	-0.25
Inverse correlation – relatively high	-0.25- -0.5
Inverse correlation – high	-0.5- -.075
Inverse correlation - very high	-0.75- -1

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Table 4: Pearson correlation test output

Athletic motivation	Resilience		
.436(**)	1	Pearson coefficient	
.000		Sig.	Resilience
245	245	Number	
1	.436(**)	Pearson coefficient	
	.000	Sig	Athletic motivation
245	245	Number	

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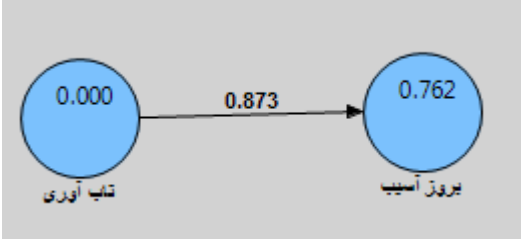


Chart 1: measurement of hypothesis model number 1 and the results of hypotheses in standard mode

Table 5: results of research hypothesis number 1

Result	Sig	SD	Hypotheses
Confirm	87.09	0.87	Resilience has a direct relationship with the occurrence of injuries among runners.

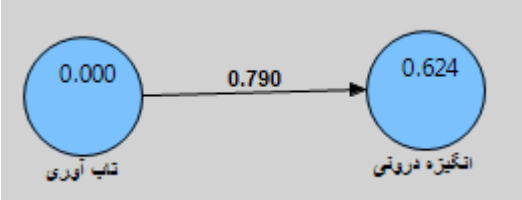


Diagram 2: measurement of hypothesis model number 2 and the results of hypotheses in standard mode

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Table 6: results of research hypothesis number 2

Result	Sig	SD	Hypotheses
Confirm	61.28	0.79	Resilience is directly related to intrinsic motivation among runners.

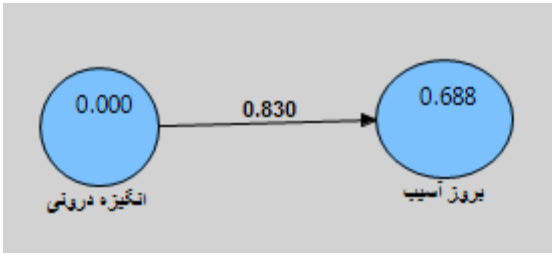


Diagram 3: measurement of hypothesis model number 3 and the results of hypotheses in standard mode

Table 7: results of research hypothesis number 3

Result	Sig	Standard	Hypotheses
Confirm	63.67	0.83	Intrinsic motivation has a direct relationship with the occurrence of injuries among runners.

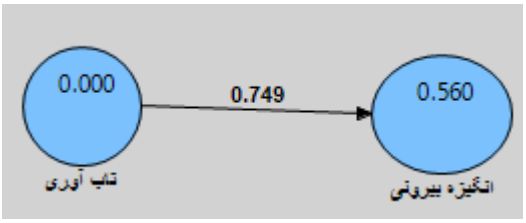


Diagram 4: measurement of hypothesis model number 4 and the results of hypotheses in standard mode

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Table 8: results of research hypothesis number 4

Result	Sig	Standard	Hypotheses
Confirm	42.25	0.74	Endurance has a direct relationship with extrinsic motivation among runners.

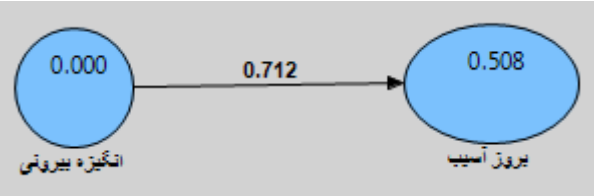


Chart 5: measurement of hypothesis model number 5 and the results of hypotheses in standard mode

Table 9: results of hypothesis number 5 of the research

Result	Sig	Standard	Hypotheses
Confirm	22.21	0.71	Extrinsic motivation has a direct relationship with the occurrence of injuries among runners.

Table 10: Mediating hypotheses test

result		Standard β value				Hypothesis
	β3	β2	0.66			
Confirm	intrinsic on the injury	Resilience on the intrinsic	Total effect	Indirect effect	Direct effect	The role of intrinsic motivation in the relationship between resilience and injury
	0.70	0.04	0.31	0.70 x (0.04)	0.29	
Confirm	intrinsic on the extrinsic	Resilience on the extrinsic	Total effect	Indirect effect	Direct effect	The role of extrinsic motivation in the relationship between resilience and injury
	0.50	0.39	0.48	0.50 x (0.39)	0.29	

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Table 11: Testing hypothesis number 7

Result		Standard β value				Hypothesis
	β3	β2	0.66			
Confirm	Intrinsic on extrinsic	Resilience on intrinsic	Total effect	Indirect effect	Direct effect	The role of extrinsic motivation in the relationship between resilience and injury
	0.50	0.39	0.48	0.50 x (0.39)	0.29	

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