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The role of Disorder Eating in Athlete Performance in China

Du Yufeng [1], Quan Zhao [2*], Lu Xiaochun [1]

Abstract
The objective of this study is to examine the role of disorder eating in athlete performance. To examine the role of disorder eating in athlete performance, the role of disorder eating, energy deficiency, negative eating behavior and demotivation is also considered. Therefore, the relationship between disorder eating, energy deficiency, negative eating behavior, demotivation and athlete performance has been examined through the course of the present study. To this end, a total of nine hypotheses are proposed in this study including six direct hypotheses and three indirect hypotheses. Data is collected from a population of athletes in China and a questionnaire is used the main instrument for data collection wherein a Likert scale is used on account of its suitability for collecting the opinion and views of individuals. After analyzing the data using a statistical tool, it is observed that disorder eating has an important role in athlete performance. It is found that; disorder eating has a positive effect on energy deficiency. It also has positive effect on negative eating behavior. Disorder eating is found to have a positive effect on demotivation. Furthermore, energy deficiency has negative effects on athlete performance. Negative eating behavior has a negative effect on athlete performance. Finally, demotivation also has negative effect on athlete performance.
Keywords: disorder eating, energy deficiency, negative eating behavior, demotivation, athlete performance.

Introduction

Sports competitions are gaining popularity day by day worldwide. Almost all countries are participating in global or regional sports competitions. China is one of these countries which is also actively participating in various national and international competitions. Chinese athletes are participating and performing at higher level across all types of sports and games. The importance of physical health education and sports education is also a recognized priority for the government in the country (N. Li, 2021). Sports have major importance because various athletes from China represent their country across the world. Therefore, the Chinese government is also particularly focusing on the sports industry.

In this direction, the role of athlete performance is key to the success. To compete on an international level, the players must have a high-performance record which will lead to a higher success rate in competition. However, many athletes still report low level performances which have a negative effect on the overall success rate. As stated in previous studies, athlete performance is particularly important in competition (Males, Kerr, & Hudson, 2021; McCosker, Renshaw, Russell, Polman, & Davids, 2021). First, most athletes undergo training at domestic level. They participate in various competition at domestic level and then participate at the international level. These athletes must have a certain level of performance to compete at international level.

There are several factors which have an influence on athlete performance. The current study has highlighted the most important factor which is largely overlooked by previous studies. According to the current study, disorder eating (McCuen-Wurst, Ruggieri, & Allison, 2018; Otani et al., 2021) has an important role in athlete performance. Disorder eating has a negative influence on athlete performance. It could decrease the level of athlete performance. Generally, disorder eating has the chance to promote energy deficiency, negative eating behavior and demotivation which further leads to a decrease in athlete performance. Energy deficiency, negative eating behavior and demotivation lead to a decrease in athlete performance.

Therefore, the objective of this study is to examine the role of disorder eating in athlete performance. The relationship between disorder eating, energy deficiency, negative eating behavior, demotivation and athlete performance is examined to fulfil the objectives of the study. Several previous studies have examined athlete performance (Crewther, Hamilton, Kilduff, Drawer, & Cook, 2018; McLean, Strack, Russell, & Coutts, 2019; Woods, Rothwell, Rudd, Robertson, & Davids, 2021), however, none of the studies highlights the role of disorder eating on athlete performance. Therefore, this study makes an important contribution to the literature by examining the relationship between disorder eating, energy deficiency, negative eating behavior, demotivation, and athlete performance.

Literature Review

An athlete is a person who competes in one or more

[1] Xi'an Academy of Fine Arts, Shanxi Xi'an 710065
[2] School of sciences, Xi'an Technological University, Xi'an City, Shaanxi 710021
Corresponding Author: Quan Zhao, zhaoquan@xatu.edu.cn

sports that involve physical strength, speed, or endurance. During the competition, the performance of athlete is of vital importance and is based on multiple and multi-faceted factors. Chinese sports industry boasts several individual athletes and teams of athletes who participate in international competition. Chinese sports industry holds major importance for China (Y. Li, 2017; Ying, 2018) as this industry makes an important contribution to economic development. The contribution of Chinese sports industry to the economy of China cannot be neglected. This industry produces on the athletes who compete in regional and international sports competitions. The performance of these athletes is based on several factors. In this study, disorder eating is identified, understood and studies as one of these important factors which affect an athlete's performance. According to this study, energy deficiency, negative eating behavior and demotivation are also most important factors to consider when studying athlete performance. Disorder eating has a relationship with the energy deficiency, negative eating behavior and demotivation of the athletes which further effect negatively on the athlete's level and quality of performance. Figure 1 shows the relationship between disorder eating, energy deficiency, negative eating behavior, demotivation, and athlete performance.

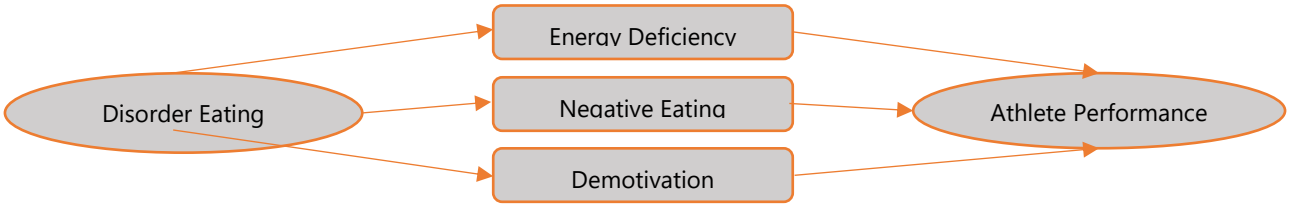

Figure 1. Theoretical framework of the study showing the relationship between disorder eating, energy deficiency, negative eating behavior, demotivation, and athlete performance

Healthy diet is particularly important for an athlete because it has a close relationship with the energy of athletes and a certain level of energy is always required to achieve success in physically exacting activities like sports. Therefore, eating has an important relationship with an individual athlete's performance. However, disorder in eating may have negative consequences. It may decrease the athlete performance, showing a negative effect on team performance. An eating disorder is a mental disorder described by irregular eating behaviors that negatively affect a person's physical as well as mental health. Types of eating disorders contain anorexia nervosa, bulimia nervosa, binge eating disorder, avoidant restrictive food intake disorder, and other specified feeding(Talha, Azeem, Sohail, Javed, & Tariq, 2020). Various studies also highlight that disorder eating has a significant influence on individuals (Hilbert et al., 2019; McCuen-Wurst et al., 2018; Stice, Marti, Shaw, & Rohde, 2019). Disorder eating has a relationship with energy deficiency. The athlete should not have energy deficiency as it affects negatively on their overall performance. Energy accessibility is the quantity of energy one must fuel the body's requirements after a person subtracts out the energy which is use for exercise. Energy shortage/ Low Energy Availability means you do not have enough energy for your body's needs.

Disorder eating leads to a low level of energy. It decreases the level of energy, which in turn, affects negatively on the performance of the individual or team. Energy deficiencies have a direct and negative effect on athlete performance. As previous studies also report, there is an important relationship between energy and athlete performance (Ackerman et al., 2019; Ackerman et al., 2020). Energy deficiency is one of the most important factors which influence the performance of athletes. Generally, it causes various negative situations which indirectly effect on the performance of the player during a sports match. To enhance the performance of the players, the role of energy is most important. To maintain a log stamina in match, the player must have a sufficient level of energy, Along with the effect of disorder eating on energy deficiency and athlete performance, disorder eating also has an important role in negative eating behavior. Eating behavior is a comprehensive term that includes food choice as well as motives, feeding practices, dieting, and eating-based problems such as obesity, eating disorders, and feeding disorders. The negative eating behavior of the players affect them negatively which causes a decrease in overall performance. According to previous studies, eating behavior has an important role in individual people's life (Stok et al., 2018; Zehner, Umstätter, Niederhauser, & Schick, 2017). Disorder eating has a relationship with eating behavior. Generally, negative eating behavior is influenced by disorder eating. Disorder eating increases negative eating behavior which shows a negative effect on athlete performance. Increase in negative eating behavior decreases the level of athlete performance(Talha, 2020).

Moreover, motivation is also another factor which has an influence on athlete performance. Along with the

other activities, athlete motivation also holds major significance in sports. A motivated player always performs better as compared to a player having a low level of motivation. The role and impact of of motivation has been addressed by a number of previous studies (Agung & Widnyana, 2020; Sabbagha, Martins, & Ledimo, 2018) which show that motivation has major importance for individuals. However, demotivation has negative effect on the performance of activities of an individual. Motivation is a force which potentially enhances the level and quality performance(Yang&Talha,2021).

However, demotivation is like a negative force which leads to a decrease in the motivation. According to the current study, disorder eating has a negative role in player motivation. Demotivation has positive effect on demotivation which shows that it increases the level of demotivation and consequently, this lowered level of demotivation leads to a decrease in the athlete's performance. From the above discussion, following hypotheses are proposed.

Hypothesis 1. Disorder eating has positive effect on energy deficiency.

Hypothesis 2. Disorder eating has positive effect on negative eating behavior.

Hypothesis 3. Disorder eating has positive effect on demotivation.

Hypothesis 4. Energy deficiency has negative effect on athlete performance.

Hypothesis 5. Negative eating behavior has negative effect on athlete performance.

Hypothesis 6. Demotivation has negative effect on athlete performance.

Hypothesis 7. Energy deficiency mediates the relationship between disorder eating and athlete performance.

Hypothesis 8. Negative eating behavior mediates the relationship between disorder eating and athlete performance.

Hypothesis 9. Demotivation mediates the relationship between disorder eating and athlete performance.

Methodology

The current study is based on a quantitative research technique. Generally, three research techniques are most popular; 1) quantitative approach, 2) qualitative approach and 3) mixed method approach. However, the current study was only based on the quantitative research approach. Quantitative research approach is a technique in which primary data and secondary data can be used to extract results. The current study uses primary data to obtain results. Therefore, firsthand data was used in this study to examine the relationship between disorder eating, energy deficiency, negative eating behavior, demotivation, and athlete performance. Primary data can be collected through questionnaires, surveys, and interviews. This study uses a survey questionnaire for data collection(Talha, Sohail, & Hajji, 2020).

400 questionnaires were used in this study for data collection purposes. The respondents of the study are the individual athletes from China. Therefore, questionnaires were distributed among the target population of athletes in China. Prior to data collection, the purpose of the study was explained to the respondents who were assured that the response will only be used for research purposes. That is the reason respondents provide feedback accurately. The feedback of respondents was collected on Likert scale. 5-point Likert scale was preferred for use in this study as it is generally deemed most suitable compared to the other scales. This is so because it reduces the level of frustration among the respondents and increases the originality (Hameed & Naveed, 2019). Finally, from a total 400 questionnaires, only 175 questionnaires were received back. From these questionnaires, five questionnaires were missing significant part of the responses. Therefore, a total of 170 responses were utilized for data analysis.

Findings

Findings of the study are based on the primary data which is analyzed by using statistical software. First, firsthand data collected from the respondents was examined to fix the errors. The attributes of the data are provided in Table 1.

Table 1

Data Statistics

	No.	Missing	Mean	Median	Min	Max	Standard Deviation	Excess Kurtosis	Skewness
DE1	1	0	3.135	4	1	5	1.037	0.959	-1.122
DE2	2	0	4.045	4	1	5	1.024	0.315	-0.988
DE3	3	0	3.936	4	1	5	1.104	0.107	-0.905
DE4	4	0	4.217	4	1	5	0.905	1.751	-1.276
DE5	5	0	4.261	4	1	5	0.767	1.042	-0.915
DE6	6	0	4.134	4	1	5	0.938	0.311	-0.972
ED1	7	0	4.115	4	1	5	1.053	0.484	-1.092
ED2	8	0	3.981	4	1	5	1.074	-0.029	-0.866
ED3	9	0	4.045	4	1	5	1.079	0.015	-0.919

ED4	10	0	4.064	4	1	5	1.075	0.121	-0.967
ED5	11	0	4.019	4	1	5	1.062	0.286	-0.941
ED6	12	0	4.121	4	1	5	0.777	1.54	-0.956
NEB1	13	0	4.032	4	1	5	1.006	-0.332	-0.709
NEB2	14	0	4.134	4	1	5	0.952	-0.014	-0.809
NEB3	15	0	4.083	4	1	5	0.944	-0.29	-0.717
NEB4	16	0	4.134	4	1	5	0.904	0.148	-0.844
NEB5	17	0	3.911	4	1	5	0.973	0.245	-0.782
NEB6	18	0	4.025	4	1	5	0.957	0.519	-0.975
DM1	19	0	4.025	4	1	5	1.009	-0.211	-0.84
DM2	20	0	4.025	4	1	5	1.088	0.159	-1.009
DM3	21	0	4.051	4	1	5	1.027	1.125	-1.172
DM4	22	0	3.873	4	1	5	1.069	-0.482	-0.627
AP1	23	0	3.898	4	1	5	0.939	-0.681	-0.354
AP2	24	0	3.962	4	1	5	0.909	-0.063	-0.54
AP3	25	0	4.134	5	1	5	1.124	-0.132	-1.029
AP4	26	0	4.127	5	1	5	1.116	-0.213	-0.977
AP5	27	0	4.204	5	1	5	1.057	0.852	-1.233
AP6	28	0	4.178	5	1	5	1.109	-0.037	-1.067
AP7	29	0	4.178	5	1	5	1.154	0.19	-1.159
AP8	30	0	3.573	4	1	5	1.263	-0.893	-0.454

Note: DE = Disorder Eating; ED = Energy Deficiency; NEB = Negative Eating Behavior; DM = Demotivation; AP = Athlete Performance

Table 1 demonstrates the missing value which is shown in column three. According to the results, the whole data has no missing value (Aydin & ŞENOĞLU, 2018), therefore, it is accurate to proceed. Furthermore, this study also examined any outlier in the data which may alter the original results. Besides, last two columns of the Table 1 show the normality of the data. However, normality of the data is not required in current study because this study is using Partial Least Square (PLS) which is suitable to deal with the non-normal data (Hair Jr, Hult, Ringle, & Sarstedt, 2016).

Moreover, the current study also examined reliability as well as validity. Reliability was examined with the help of factor loadings. The minimum level of factor loadings was considered 0.5 as recommended by previous studies (J. Hair, Hollingsworth, Randolph, & Chong, 2017; J. F. Hair, Sarstedt, Pieper, & Ringle, 2012; Rashmi et al., 2013). The factor loadings of all the items were considered. It is observed that all the items have factor loadings above 0.5. The factor loadings above 0.5 signifies a confirmation of internal consistency. The reliability is given in Table 2 which shows that it is above 0.7.

Table 2

Reliability and Convergent Validity

	A	rho_A	CR	(AVE)
Athlete Performance	0.927	0.935	0.942	0.673
Demotivation	0.764	0.791	0.854	0.601
Disorder Eating	0.847	0.848	0.887	0.567
Energy Deficiency	0.898	0.915	0.925	0.68
Negative Eating Behavior	0.857	0.861	0.894	0.585

To examine the external consistency, this study also examined the average variance extracted (AVE). According to previous studies, AVE must be above 0.5 for all variables. Table 2 shows that; disorder eating, energy deficiency, negative eating behavior, demotivation and athlete performance have AVE above 0.5. Additionally, cross-loadings was examined for discriminant validity (Henseler, Ringle, & Sarstedt, 2015) which is given in Table 3.

Table 3

Cross-Loadings

	Athlete Performance	Demotivation	Disorder Eating	Energy Deficiency	Negative Eating Behavior
AP1	0.649	0.586	0.534	0.44	0.508
AP2	0.622	0.56	0.495	0.432	0.531
AP3	0.885	0.625	0.703	0.666	0.691
AP4	0.885	0.61	0.679	0.66	0.648
AP5	0.9	0.64	0.647	0.614	0.644
AP6	0.905	0.625	0.678	0.696	0.618
AP7	0.923	0.629	0.669	0.653	0.622
AP8	0.728	0.622	0.567	0.604	0.46

DE1	0.502	0.775	0.753	0.482	0.565
DE2	0.494	0.834	0.716	0.503	0.538
DE3	0.718	0.83	0.717	0.821	0.6
DE4	0.54	0.863	0.759	0.526	0.706
DE5	0.585	0.869	0.82	0.51	0.779
DE6	0.588	0.838	0.749	0.543	0.696
DM1	0.672	0.868	0.933	0.631	0.718
DM2	0.581	0.853	0.894	0.586	0.696
DM3	0.542	0.803	0.872	0.548	0.57
DM4	0.513	0.529	0.829	0.376	0.345
ED1	0.551	0.523	0.66	0.866	0.634
ED2	0.699	0.601	0.663	0.894	0.606
ED3	0.687	0.608	0.619	0.916	0.587
ED4	0.647	0.604	0.64	0.926	0.563
ED5	0.62	0.644	0.644	0.904	0.539
ED6	0.353	0.464	0.487	0.76	0.464
NEB1	0.412	0.361	0.551	0.41	0.704
NEB2	0.444	0.439	0.657	0.457	0.805
NEB3	0.579	0.538	0.759	0.506	0.859
NEB4	0.494	0.513	0.715	0.509	0.782
NEB5	0.678	0.772	0.626	0.62	0.802
NEB6	0.665	0.831	0.619	0.623	0.927

Note: DE = Disorder Eating; ED = Energy Deficiency; NEB = Negative Eating Behavior; DM = Demotivation; AP = Athlete Performance

Figure 2 shows that; disorder eating is measured by using six items, energy deficiency is measured by using six items, negative eating behavior is also measured by using six items, demotivation is measured by using four scale items and athlete performance is measured by using eight scale items. To test the hypotheses, the relationship between disorder eating, energy deficiency, negative eating behavior, demotivation and athlete performance was examined with the help of PLS bootstrapping. PLS bootstrapping is most recommended by previous studies (F. Hair Jr, Sarstedt, Hopkins, & G. Kuppelwieser, 2014; J. F. Hair, 2010; J. F. Hair, Ringle, & Sarstedt, 2013; Hair Jr et al., 2016; Henseler & Fassott, 2010).

In this process, the effect of disorder is examined on energy deficiency and negative eating behavior. In terms of the effect of energy deficiency on athlete performance, the direct effect of negative eating behavior is examined on athlete performance. The direct effect of demotivation is also examined on athlete performance. Results of the study are given in Table 4 which show that the relationship between eating disorder and energy deficiency is significant. The relationship between eating disorder and demotivation is also significant. Moreover, the relationship between eating disorder and negative eating behavior is also significant. All these relationships are significant because the t-value is above 1.96. Moreover, the effect of energy deficiency is also significant in relation to athlete performance. The effect of demotivation is also significant on athlete performance. Finally, it is observed that the effect of negative eating behavior also has a significant impact on athlete performance.

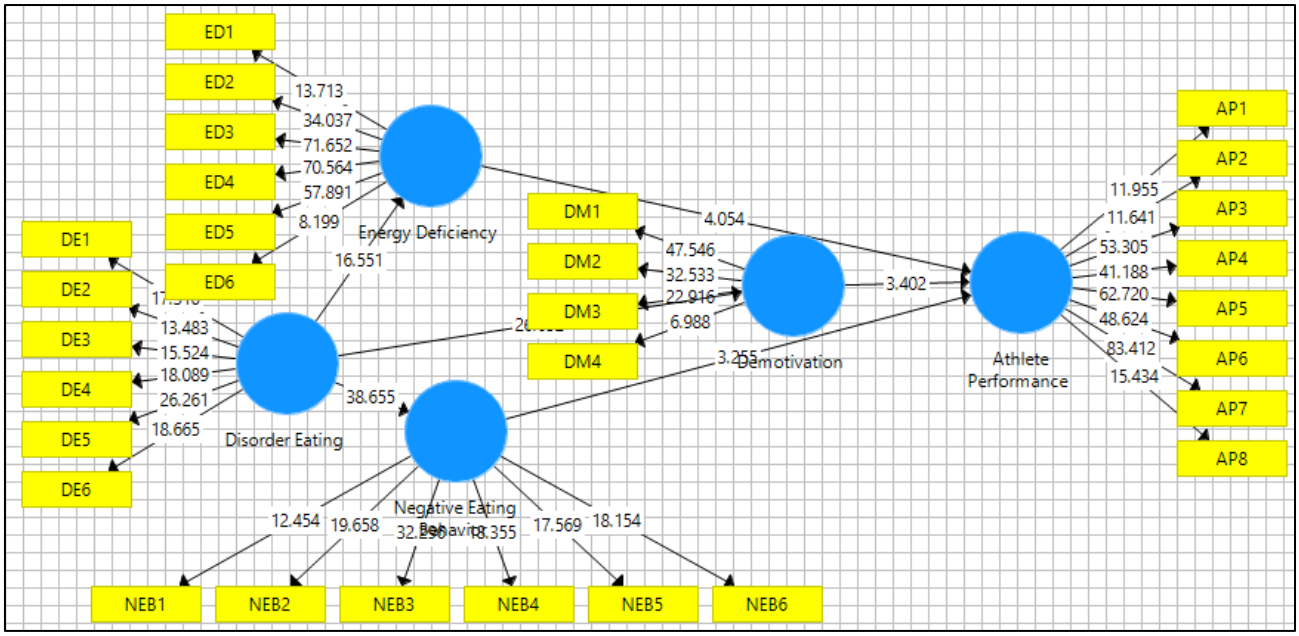

Figure 2. Structural Model

Note: DE = Disorder Eating; ED = Energy Deficiency; NEB = Negative Eating Behavior; DM = Demotivation; AP = Athlete Performance

Table 4

Direct Effect Results

	β	Mean	SD	T Statistics	P Values
Demotivation -> Athlete Performance	-0.319	-0.326	0.094	3.402	0.001
Disorder Eating -> Demotivation	0.81	0.81	0.03	26.652	0
Disorder Eating -> Energy Deficiency	0.756	0.753	0.046	16.551	0
Disorder Eating -> Negative Eating Behavior	0.862	0.862	0.022	38.655	0
Energy Deficiency -> Athlete Performance	-0.344	-0.335	0.085	4.054	0
Negative Eating Behavior -> Athlete Performance	-0.242	-0.245	0.074	3.255	0.001

Finally, this study examines the indirect effect. First, indirect effect of energy deficiency is examined between disorder eating and athlete performance. Second, indirect effect of negative eating behavior is examined between disorder eating and athlete performance. The third indirect effect of demotivation is also examined between disorder eating and athlete performance. In this study, the mediation effect is examined by following the instructions of Preacher and Hayes (2004, 2008). First, indirect effect of energy deficiency between disorder eating and athlete performance is significant with t-value 3.908. Second, indirect effect of negative eating behavior between disorder eating and athlete performance is also significant with t-value 3.229. Third, the indirect effect of demotivation between disorder eating and athlete performance is also found to be significant with t-value 3.28.

Table 5

Indirect Effect Results

	β	Mean	SD	T Statistics	P Values
Disorder Eating -> Demotivation -> Athlete Performance	-0.259	0.265	0.079	3.28	0.001
Disorder Eating -> Energy Deficiency -> Athlete Performance	-0.26	0.252	0.067	3.908	0
Disorder Eating -> Negative Eating Behavior -> Athlete Performance	-0.208	0.212	0.065	3.229	0.001

Results of the study in Table 5 show that energy deficiency mediates the relationship between disorder eating and athlete performance. Moreover, it is found that; negative eating behavior mediates the relationship between disorder eating and athlete performance. Finally, demotivation mediates the

relationship between disorder eating and athlete performance. According to the design of the study, a total of nine hypotheses are proposed. Six direct hypotheses are proposed, and all the direct hypotheses are supported. Furthermore, three indirect hypotheses are proposed, and all the direct effect are also found to be significant.

Discussion and Conclusion

This study is based on athlete performance in China in which the role of disorder eating is examined in relation to athlete performance. To address this effect, the relationship between disorder eating, energy deficiency, negative eating behavior, demotivation and athlete performance is examined using data from a population of Chinese athletes. Therefore, primary data is collected using a survey instrument and results have been obtained by using statistical tool.

It is found that disorder eating has positive effect on energy deficiency. It shows that increase in disorder eating increases energy deficiency. Among Chinese players, energy deficiency can be observed due to disorder eating. Disorder eating also has a positive effect on negative eating behavior. Negative eating behavior can be increased through disorder eating as this study found that increase in disorder eating increases the level of negative eating behavior among Chinese players. Along with energy deficiency and negative eating behavior, demotivation also has a major contribution due to disorder eating. Disorder eating affects the motivation state of the players. Results shows that increase in disorder eating increases the level of demotivation by decreasing the level of motivation among athlete players. Disorder eating has a positive effect on demotivation which shows that disorder eating increases the level of demotivation. Besides, energy deficiency has a negative effect on athlete performance. It shows that energy deficiency has a negative effect on players because it decreases the performance of the players. Athletes cannot perform well without the proper energy. Therefore, energy deficiency effects negatively on the performance. Negative eating behavior has a negative effect on athlete performance. Lastly, demotivation has a negative effect on athlete performance. Increase in the motivational level generally increases the performance of the players, however, demotivation leads to a decrease in performance. As proved by the current study, increase in demotivation among Chinese players can decrease the performance.

Thus, results of the study show that disorder eating increases energy deficiency which further decreases the athlete performance. Furthermore, disorder eating increases negative eating behavior which further leads to a decrease in athlete performance. Finally, disorder eating increases the level of demotivation among players which further decreases athlete performance. Therefore, according to the results of the current study, energy deficiency, negative eating behavior and demotivation play an important role between disorder eating and athlete performance. It shows that; energy deficiency reflects the negative effect of disorder eating on athlete performance. Negative eating behavior also reflect the negative effect of disorder eating on athlete performance. Finally, demotivation reflects the negative effect of disorder eating on athlete performance.

Implications

The current study has significant theoretical implications as this study contributes significantly to the literature by examining the unique relationship between disorder eating, energy deficiency, negative eating behavior, demotivation, and athlete performance. This is the first study which examines the effect of disorder eating of players on energy deficiency. Similarly, this is an important study because it examines the effect of disorder eating on demotivation and negative eating behavior of athletes. This study also tests the important effect of energy deficiency, negative eating behavior and demotivation on athlete performance. Therefore, this study contributes to literature by examining the effect of disorder eating on athlete performance. In addition to this, the current study investigates three additional effect which are not addressed in the literature by previous studies. First, mediation effect of energy deficiency is examined between disorder eating and athlete performance. Second, mediation effect of negative eating behavior is examined between disorder eating and athlete performance. Thirdly, the mediation effect of demotivation is examined between disorder eating and athlete performance.

Practically, this study is particularly valuable for practitioners. Especially for the trainers and coaches who train and coach the players. It has major importance for coaches to help them enhance the performance of their players by avoiding or minimizing the negative effect of disorder eating. Disorder eating by players must be discouraged to get higher performance. In addition to this, negative behavior of the players should also be discouraged. As negative eating behavior is one of the most influential factors in terms of its role in athlete performance. Therefore, the findings of the current study hold major relevance for practitioners to enhance their athlete performance.

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