

Towards the athletic psychological adjustment: an empirical study based on the Inverted-U-Type hypothesis

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Abstract. The technical and emotional control of the javelin game plays an important role for the athlete's performance. However, previous researches show that many psychological methods do not consider the psychological state of the athletes, and take the corresponding measures for psychological adjustment. In this paper, we propose an improved Inverted -U-Type hypothesis method for athlete's psychological adjustment during the training time before competition. According to the athletes' psychological state, adjusting the factors, we carry the weak and strong interventions to adjust psychological and physiological state of the athletes to an optimal level. The results show that the adjustment of the athletes' psychological by our method can effectively eliminate the impact of internal and external factors to improve the stability, which is also help for the athletes' psychological training of other sports.

1. Introduction

Psychological factors, such as self-confidence and stress management, have been proven as a decisive role in the athletic performance for top athletes [1], but they also apply to inexperienced amateur athletes [2]. The athletes or exercisers need to develop more feasible psychological resilience to achieve better performance [3]. Psychological resilience is defined as a natural or developmental psychological advantage that can often better cope with many of the demands of the sports (competition, training, lifestyle) than the opponent, especially when maintaining firmness, concentration, self-confidence and control of stress [4]. Individual sports, such as archery, are particularly challenging, and their performance will be concentrated and expressive [5,6]. Kim et al. [8] study identified four types of key success factors, e.g. skill factors, adaptation factors, strategic factors and psychological factors, affect edge results in Korean archery through qualitative methods (interviews with archery coaches) and quantitative methods (validation analysis of 463 archers). In this study, the psychological factors, including confidence, attention, and emotional control, account for 51.9 percent of performance factors, while skills-attributed factors do 32.8 percent.

However, there are few studies that detail the performance factors in team sports, although empirical studies have proven the importance of psychological factors in team sports [9,19]. When individual performance is in the spotlight during a game. For example, an American football quarterback throws a ball [10], a baseball player on a home run, or a football player makes a penalty shoot-out during an important game [11]. Thus, it is reasonable to assume that the psychological factors in team sports are equivalent to individual sports in this regard.

In our study, we takes the javelin as an example. Javelin is a personal sport belongs to the athletics, in which psychological resilience is often emphasized as a necessary element. In modern javelin competition, the psychological quality of the athletes determines the results of the competition. Especially in important games like the Olympic games, the psychological quality often plays a decisive role in the last throw. Thus, the improvement of the psychological quality of the athletes during the competition is a key and challenging issue for coaches, athletes and researchers [12]. A

potential way to achieve better results during the competition is to adjust their psychological state of the athletes [13].

In recent year, the physiological arousal is playing an important role in all people's activities, which is of critical importance to the study of sports psychology [14,15]. As the physiological arousal rises, the athletes' performance can be improved [16]. After reaching the optimal level of physiological arousal, they achieve the best state for the game. However, if the physiological arousal level is over-awaken, the performance of the athletes are degraded. Such phenomenon is called the Inverted-U-type hypothesis. A kind of sports obeys this hypothesis means that this kind of sports has an optimal physiological arousal level for its best results.

However, for the Inverted-U-type hypothesis, there is no predictive validity in the actual situation. Many other factors also have a huge impact on the athletic performance, such as personal emotion, venues, and ranking pressures, etc, which are important for athletes to achieve good results in games [17]. Without considering other external factors, the hypothesis only takes the fact that athletes achieve the optimal physiological arousal level into account. In fact, the competition sports are changing rapidly. Any improperly handled detail affects the performance of athletes. Therefore, we should consider as much factors as possible, which is essential for every athlete and coach [18].

In this paper, we propose a new method of athletic psychological adjustment based on the Inverted-U-type hypothesis. Considering the internal and external factors for the psychological state of the athletics, the weak and strong interventions are carried out according to these factors. Our method effectively help to eliminate the unfavorable factors to improve the psychological and physiological of the athletes to achieve the best performance.

2. Athletic Psychological Adjustment based on the Inverted-U-Type hypothesis

In 1908, the American psychologist Yex and his student Dodson completed a variety of difficult tasks. Through the rat's classic experiment, they concluded that perception recognition and complex connection of the work skills with weak stimulation can be achieved in the relationship, while the habit of simple work needs to be developed with strong stimulation. They assumed that the relationship between physiological arousal and operational performance is inverted U-curve, which is the theoretical foundation of the Inverted-U-Type hypothesis.

The Inverted-U-Type hypothesis is the most discussed theory in the study of the relationship between physiological arousal and operational performance. As shown in Fig.1, the hypothesis holds that the relationship between physiological arousal and operational performance is inverted U-curve, which x indicates the level of physiological arousal and $f(x)$ indicates the good or bad performance of the athletes. The hypothesis put forward as follows: when the people is at the low level of physiological arousal, the work efficiency is low and at this time the psychological state is in the yellow interval or red interval in Fig.1; only at the medium level of physiological arousal, the highest efficiency is the green interval in Fig.1.

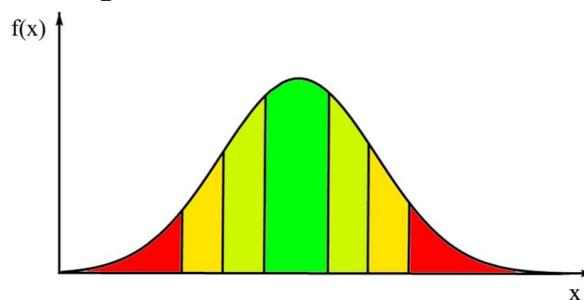


Fig. 1. The Inverted U-Type hypothesis

This hypothesis is of great reference value to the coaches and athletes, which helps to improve the performance of the athletes [24,25]. However, not considering some objective factors, it still has some limitations. Affecting the performance of athletes, these factors include personal factors, ranking pressure, emotional condition, competition situation and the physiological cycle of female athletes, etc. The factors have a huge impact on the athlete's performance. They are the key to athletes

can play normally and achieve good results in the competition. It is obviously that the hypothesis don't take into account these factors. Therefore, in the following section, we propose a new method of athletic psychological adjustment.

3. Conclusion

The psychological quality is critically important for the athletes to achieve good performance. The psychological adjustment is indispensable. We briefly review the limitations of the existing researches has limitations. Then, we propose an improved Inverted-U-Type hypothesis method for athletic psychological adjustment. Our method adjusts the athletic psychological state to an optimal level by strong or weak intervention by taking different measures for athletes in different psychological states. The results show that our method helps the athletes to achieve personal breakthroughs and create their own success. In future, we plan to extend this method to the applications of other domains, such as time series analysis [7,20-23].

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