TECHNICAL ANALYSIS OF AIR RIFLE SHOOTING IN ELITE SHOOTERS

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INTRODUCTION: The Chinese National Shooting Team has consistently won gold medals in the Olympic Games since 1984 (with the exception of 1988). This raises the question of why the Chinese National Shooting Team has produced so many champions and what principles were applied in the shooting performance. The purpose of this study was to provide research on principles of the shooting performance by testing Chinese elite shooters using the Noptel ST-2000 made in Finland, and to establish a technical analysis model of shooting performance. Successful shooting performance is considered to be the product of three basic technical factors: hold, aim and trigger control. A shooter's hold is demonstrated by his ability to control specific muscles and to prevent unwanted movement. Aim is related to the accuracy with which the subject is able to direct the gun at the desired point on the target. Finally, trigger control is denoted by the timing of the actual triggering event, relative to the hold/aim process and the cleanness with which triggering took place.

METHODS: Ten male subjects from Chinese Nation Shooting Team volunteered for this study. They were air rifle shooters, all of whom had won world championships in the past. At the present time, these athletes are preparing for the Olympic Games in Sydney in 2000. The Noptel ST-2000 accurately measures the gun orientation path on the target surface before the shot, records the actual shot and continues to record measurements over a selected period of time after the shot. This system also indicates the path of the shot and how it was generated. Each subject was tested on 60 shots, according to Games' procedure, using the Noptel ST-2000, which could provide data of hold, aim and trigger control. This technique provided a considerable amount of data, from which the technique of shooting performance could be analyzed. For example, R (t) refers to the distance of trajectory from the center of the target as a function of time. TRNDALL is the time plot of the average shot. Conventional statistical methods were used to obtain means, standard deviation and analysis of data using the SPSS statistical software package.

RESULTS: The shooting performance can be divided into two stages (Figure 1), the preparatory, or hold stage, and the actual shot, or trigger control stage. The technical analysis model of shooting performance consisted of Result and three basic factors: Hold, Aim and Trigger control (Figure 2). The data demonstrated that there was a complex connection between the basic factors and the result achieved. The success factors interact with each other. The key position was occupied by the hold factor, which was linked to the other success factors and to the result itself, i.e. it affected the result both directly and via the aim and trigger control. In addition, the result might have had a counter-effect on the hold. The shooters themselves could be divided into groups according to their technique and performance, most conveniently on the basis of the time curve. There were three groups of

Air rifle shooting styles: hold shooters, optimizing shooters and reaction shooters (Figure 3-4). This division was based on the amount of relative optimization, i.e. the amount of optimization resources that the shooter made use of (Optimization), could be calculated by subtracting the ARES (aim result in the hold stage) score from 600. The average percentage of optimization for the air rifle series was approximately 47%, the maximum 84% and the minimum 13%. A shooter with an optimization score of less than 20% per series was defined here as a hold shooter, and a person with a value of 75% as a reaction shooter.

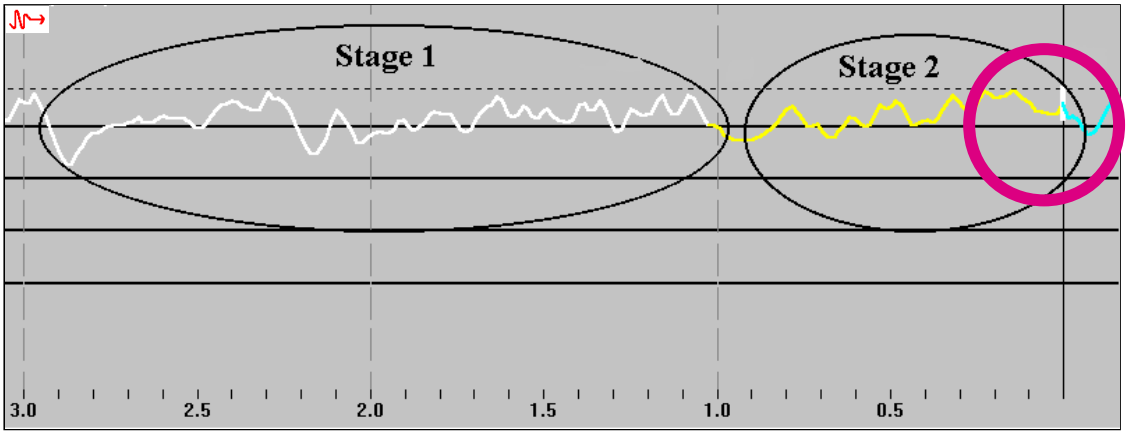

Figure 1 - Shooting performance divided into two stages: The final timing and cleanness of the triggering can be observed inside the red circle. In this case the holder has made a good trigger release

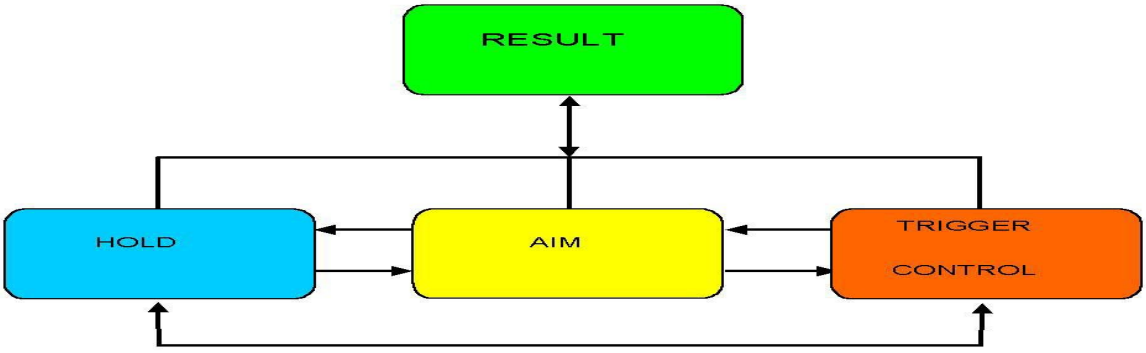

Figure 2 - Model of the shooting process

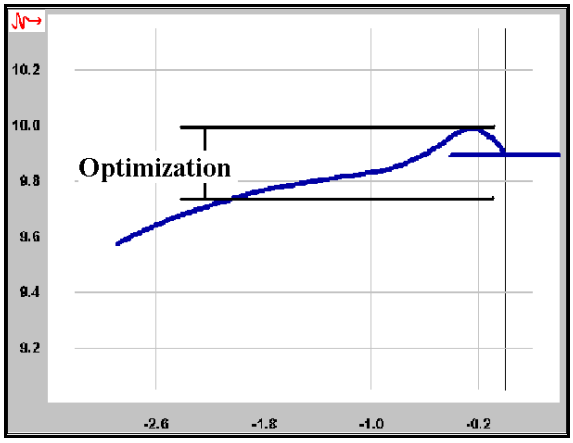

Figure 3 – Optimization

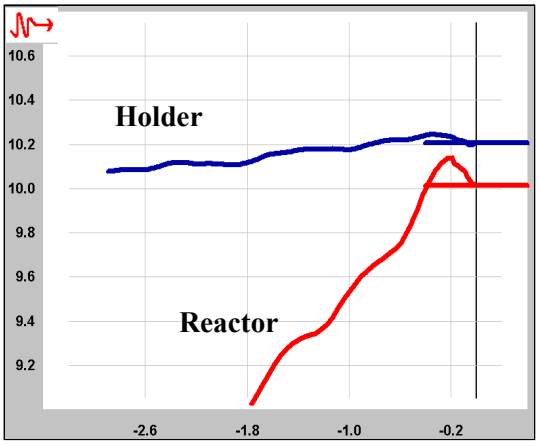

Figure 4 - Holder and Reactor

DISCUSSION: The model was based on three basic performance or success factors, namely hold, aim, and trigger control. The first two factors were determined as being relative to time during the hold stage and the third factor was at the trigger control stage. Extensive measurements provided by this study have confirmed that the model is indeed illustrative of the shooting event and could be used effectively for training purposes

REFERENCES:

Noptel Oy, Finland. Noptel ST-2000 user's guide.