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A PERFORMANCE IMPROVEMENT PROGRAM FOR AN INTERNATIONAL-LEVEL TRACK AND FIELD ATHLETE

DAVID SCOTT AND LORNA M. SCOTT

UNIVERSITY OF NEW BRUNSWICK

AND

BRAM GOLDWATER

UNIVERSITY OF VICTORIA

This study outlined the development, implementation, and evaluation of an intervention strategy that was designed to improve the technical skill and performance of an international-level pole vaulter. Intervention, in the form of a prompting and shaping procedure, consisted of breaking a photoelectric beam with the hands at the moment of take-off. The height of the beam was gradually increased until the vaulter reached maximum arm extension at take-off. Increase in arm extension was matched by an increase in bar height clearance.

DESCRIPTORS: pole vault, take-off, photoelectric beam, prompting, shaping

Pole vaulting is a highly complex athletic activity that requires power and strength coupled with fine motor skills and a biomechanically and technically efficient technique. One component of the vault, the plant, consists of placing the pole at take-off in such a way that energy developed by the vaulter is transferred to the bending pole. This can be achieved by adopting a wide grip and by maximizing the ground-to-pole angle (Houvion, 1986). The maximum ground-to-pole angle is obtained by maximizing the arm extenuation over the head at take-off. The subject in the present study had a tendency not to extend his arms, and therefore the pole, as high as he could prior to take-off. This had a direct negative impact on the height jumped. Lee (1993), in a review of operant strategies in sport, pointed out that shaping and prompting procedures have been used in the sporting environment to develop skills. However, most studies have compared a multicomponent package of interventions with a nonintervention control or baseline, making it difficult to assess the components of an intervention. Lee therefore suggested that there is a need to focus on how particular interventions work. The purpose of this present study was to evaluate a prompting and shaping intervention, in the form of a changing criterion design, that would directly assist this athlete in the technical development of his vault and corresponding height cleared.

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Requests for reprints should be sent to David Scott, Faculty of Kinesiology, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada.

METHOD

Participant

The participant was a 21-year-old university pole vaulter. He had been vaulting competitively for 10 years and had competed at both national and international competitions as a junior. He was a dedicated trainer and had his own personal coach. From a technical perspective, he had one major area of concern: On planting the pole, he avoided extending his arms completely prior to take-off. This had a direct negative impact on the height jumped. He reported being aware of this problem, but it had become a habit that he felt he was unable to break. It was hypothesized that increasing the vaulter's arm extension at take-off through a shaping procedure would result in increased vaulting heights.

Design and Procedure

The participant had initially sought out the authors to receive assistance on eradicating this technical problem. The authors attended a number of training sessions and competitions to acquaint themselves with the athlete in the practice and competitive environments.

The vaulter's ground-to-pole angle at take-off lacked consistency, with maximum angle never being displayed. The goal was to develop and maintain, at maximum height, the position of the pole during the vaulter's take-off. To improve take-off behavior, a shaping intervention based on a changing criterion design was used.

Baseline. Each vault was recorded using an Hitachi 2000 videocamera. The camera was set at a right angle at the point at which the athlete extended his arms overhead. A measuring board, marked off in 1-cm segments, was placed opposite the camera, on the other side of the vaulter. At the end of each session, the videotape was analyzed separately by each author. The height of the hands at take-off, as shown on the measuring board, was noted. Interobserver agreement was checked at the end of each session. In cases of disagreement, the tape was replayed and the specific vault was examined by the authors together. Because the authors were simply noting the height of the hands as recorded on a videotape and were permitted to replay any unclear vaults, interobserver reliability was high, with agreement ranging from 97.3% to 100%.

Baseline data were recorded over 15 sessions, and the mean hand height at take-off (2.25 m) was calculated. The baseline phase also acted as an assessment phase, in that it was designed to determine the subject's current levels of performance. Baseline lasted 14 sessions, with the number of trials (vaults) varying depending on the length of the practice and the amount of time devoted to coaching between vaults. Because the number of vaults per session varied, absolute performance was converted to a percentage.

Intervention. Prior to the beginning of intervention, the maximum arm extension height was obtained by having the participant stand and extend his arms and pole in the take-off position. This was found to be 2.54 m. A photoelectric beam replaced the camera and measuring board and was set across the runway at a height of 2.30 m (5 cm above the mean height obtained during baseline). The intervention involved the verbal prompt "reach" being shouted to the participant as he ran down the runway. The prompt was administered at a distance of 9 m from the plant box. In addition to being given the prompt, the participant was given feedback in the form of a beep when the photoelectric beam was broken, indicating that he had achieved the desired height. Intervention at this height continued until the participant displayed stability in performance at a 90% level. Stability in performance referred to the successful repetition of three or more 90% performances. Following successful completion, intervention was also administered at the following heights: 2.35, 2.40, 2.45, 2.50, and 2.52 m. This gave a total of 200 sessions over a period of 18 months.

RESULTS AND DISCUSSION

The results of this study (see Figure 1) demonstrated improvement in extension at plant. The procedure proved to be effective,

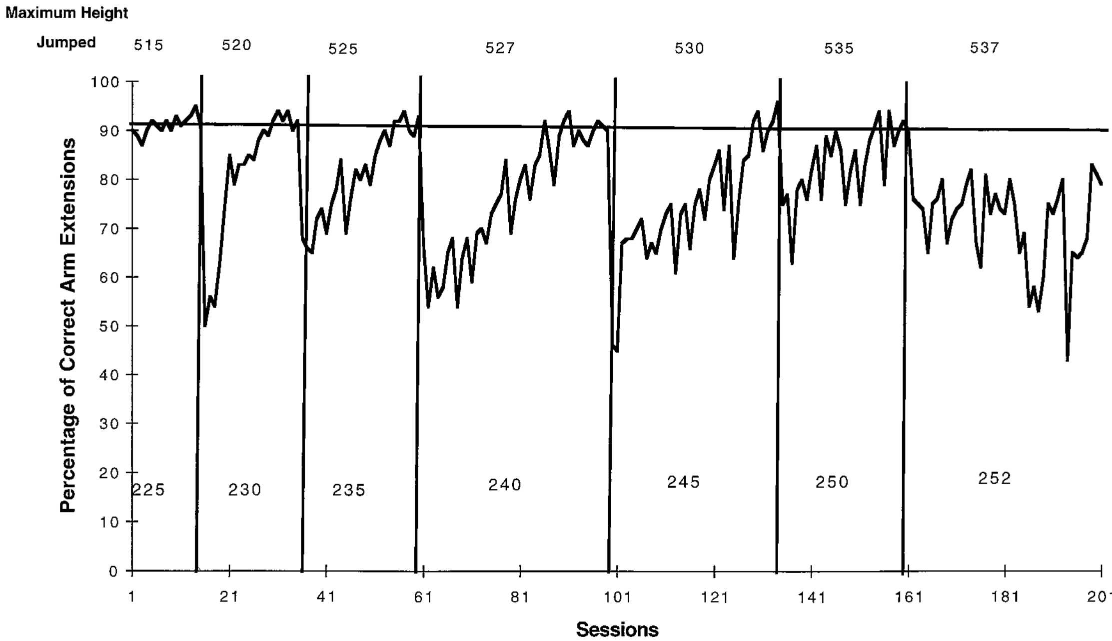

Figure 1. Percentage of correct arm extensions at seven different heights. The numbers contained within each criterion condition refer to the height of the photoelectric beam.

with the vaulter obtaining a 90% level at all heights except the final height of 2.52 m. The beep provided feedback and appeared to serve as a conditioned positive reinforcer for correct arm extension. The vaulter reported that he responded to the procedure as if it were a competition between him and the photoelectric beam. The data reported in Figure 1 may seem somewhat unstable, because they are reported in terms of the percentage of the set criterion reached. Therefore, a drop from 90% on a previous criterion to 70% on a new criterion does not necessarily mean a decrease in the actual height extension of the hands.

As shown in Figure 1, the increase in the height of arm extension also corresponded to an increase in the maximum height jumped by the vaulter. Although no formal follow-up was conducted, the vaulter has continued to jump at or around the maximum height obtained during the final intervention.

The results of this study demonstrated that the treatment conducted within a changing criterion design had a marked effect on changing take-off behavior. The technique was successful in improving the ground-to-pole angle, and this in turn had a positive effect on the maximum height cleared.

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