THE EFFECTS OF AUDITORY FEEDBACK ON POSTURAL BALANCE AND GUN BARREL STABILITY IN COMPETITIVE RIFLE AND PISTOL SHOOTERS

Ruiz Montse, Konttinen Niilo, Mononen Kaisu
(Research Institute for Olympic Sports, Finland)

Successful shooting performance is associated with good postural balance and gun stability. Previous research indicates that postural balance and gun stability, which discriminate between shooters from different skill levels (Konttinen et al., 1999; Mononen, et al., 2003), can be improved in inexperienced shooters using auditory feedback (Konttinen, et al 2004). The purpose of this study was to examine the effects of auditory feedback associated with gun-hold performance on postural balance and gun stability in competitive pistol and rifle shooters.

Participants were 12 pistol and 12 rifle shooters (14 male and 10 female; aged 37.63 SD=12.66 yrs, with 4 to 30 yrs. of sport experience). An optoelectronic shooting device (ST-2000, Noptel) recorded shooting score and gun displacement in terms of horizontal (DEVH) and vertical deviations (DEVV) of the gun barrel. A triangular-shaped force platform (Good Balance, Metitur Ltd.) measured anteroposterior (VELAP) and mediolateral (VELML) sway velocity. A single practice session consisting of four training stages was carried out. Post-shot knowledge of results was always available. Ten shots were performed in the first (KR1) and last (KR2) practice stages. In the second stage (AF), an auditory signal was provided when the aiming point was inside the 10-ring. In the third condition (IM), the shooters imagined the sound when their aiming point was inside the 10-ring.

The change in the behavioural variables (shooting score, DEVH, DEVV, VELML, VELAR) across the training stages was examined conducting an ANOVA procedure separately for each variable. The values of the four states (KR1, AF, IM, KR2)were used as within-subject factor, and the type of gun (rifle, pistol) as between-subject factor. Only for the hold variable DEVV statistically significant Stage by Gun interaction was found, Wilk's Lambda .681, $F(3,20) = 3.130$, $p = .049$. The analysis of the DEVV was elaborated with separate ANOVAs for the two groups. The variation between the stages of training was statistically significant for both, rifle $F(3,33) = 4.332$, $p= .011$ (Power .824), and pistol shooters $F(3,33) = 3.986$, $p = .016$ (Power .788). According to the Student-Newman-Keuls test of differences among four means, DEVV was lower in the AF than in the KR1 stage among pistol shooters ($p< .01$), but not among rifle shooters, who exhibited lower vertical deviation in the imagery and KR stages than in the AF stage ($p< .05$).

These results indicate that auditory feedback associated with gun-hold performance does not have a significant effect on the postural balance of competitive rifle or pistol shooters in a single practice session. However, pistol shooters benefited from auditory feedback indexed in terms of vertical deviations of the gun barrel. Such effects were not found in rifle shooters.

References

Konttinen, Lyytinen, & Era, (1999). Journal of Motor Behavior, 31, pp. 11-20.
Konttinen, Mononen, Viitasalo, & Mets, (2004). Journal of Sport & Exercise Psychology, 26, 306-316.
Mononen, Viitasalo, Konttinen, & Era, (2003). Journal of Sports Sciences, 21, 867-876.

Keywords: Feedback, Shooting