The effect of perceptual training with anxiety on the anticipatory judgments of elite badminton players

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Introduction

Skill is the defining attribute in the performance of badminton players. The ability to anticipate an opponent's actions is a central component of skill in the sport. Researchers have shown that elite racket sport players make superior anticipatory judgments when compared to less-skilled players (e.g., Williams et al., 2002), and that this ability also differentiates elite players (e.g., Ford et al., 2010). Elite players use vision in a quantitatively different manner to their less-skilled counterparts in order to extract the information used to anticipate actions (Williams et al., 2002). Video simulation training is a method that can improve on-court anticipatory judgments and visual search behaviours. Video simulation involves film of opponents during match play recorded from the perspective of the player on the other side of the net, which is edited so as to require the participant to select responses to opponent shots in simulated match play. The accuracy of anticipatory judgments and visual skills in sports, such as badminton, has been shown to improve across video simulation training (e.g., Causer et al., 2011; Williams et al., 2002). However, researchers have not shown whether the benefits of video simulation training transfer to improved on-court performance, which is the key test of any training intervention.

Sport performance deteriorates when players become anxious. Researchers have shown that the negative effects of anxiety on performance can be mediated through training under increased anxiety levels (e.g., Causer et al., 2011). In this type of training, ethical methods are used to induce anxious conditions during practice that (when compared to suitable control groups) actually negates the effects of anxiety in later stressful conditions, such as during competition. Training under high-anxiety conditions may allow individuals to acclimatise themselves to and develop strategies for the attentional and emotional demands of performing in these conditions.

The aim of this study was to examine whether the training of anticipatory judgments through video simulation can improve on-court performance in elite badminton players. A further aim was to investigate whether training in anxious conditions can enable elite players to cope with its effects during later stressful performance.

Method

Participants were 30 elite British badminton players who were allocated to either an anxiety training group (HA: n = 10), non-anxiety training group (LA: n = 10), or control group (CON; n = 10). The study involved video and field pre-tests, a video-based acquisition phase, and video and field post-tests. Figure 1 shows the experimental set-up. Both the video pre- and post-tests were split into low and high anxiety conditions. Anxiety conditions were created by the addition of stressors, including the presence of selection coaches, peer observation and comparison. In the

video-based tests, participants were required to interact as if in match play with 36 life-sized film clips showing their perspective of doubles opponents on the other side of the net who served to different areas of the court. The simulation film was occluded at racket-shuttle contact and the participant was required to respond with a return shot from the location they anticipated the shuttle would have landed. Accuracy scores were created by comparing the location from which they played their return shot to the landing location of the shuttle. The field based sessions consisted of responding to live serves from an international standard opponent serving to areas that matched the video-based sessions (n = 18). The initial movement response of participants indicated the accuracy of their anticipatory judgment and was correct when it matched the final landing position of the shuttle.

During acquisition, the training groups received instruction on the areas of the opponent's body that they should fixate vision upon, along with examples of the "gold standard" visual search. Moreover, during the acquisition sessions, the HA group practiced with stressors present, whereas the LA group did not and the CON did not participate in the acquisition sessions. A mobile eye registration system was worn throughout to measure visual search fixation locations (number, location and duration). The rating scale (RSME) (Krane, 1994) and the Mental Readiness Form v3 (MRF-3) (Zijlstra, 1993) were used to measure cognitive effort and state anxiety, respectively. Anticipation judgment accuracy (RA) and visual fixations (location, number and duration) were analysed in ANOVA.

(a) (b)

Figure 1. Set-up for (a) video-based simulation sessions and (b) the field-based session.

Results

Video-based sessions

All groups reported significantly greater anxiety during high compared to low anxiety conditions, along with greater RSME and shorter final fixation durations. Figure 2 shows anticipation judgment accuracy during the video-based sessions as a function of group. In the pre-test, there were no differences between groups in the accuracy of their anticipation judgment, but accuracy was worse in the high compared to low anxiety pre-test. In the low anxiety post-test, both training groups had greater accuracy and a longer final fixation duration compared to CON and pre-test. In the high anxiety post-test, HA were more accurate compared to LA and CON, but their accuracy was not different to the low anxiety post-test, whereas the LA group were more accurate than CON.

Field-based sessions

In the field-based pre-test, there were no differences in anticipation judgement accuracy between groups, whereas in the post-test the two training groups had greater accuracy compared to both their pre-test and the control group (see Figure 2).

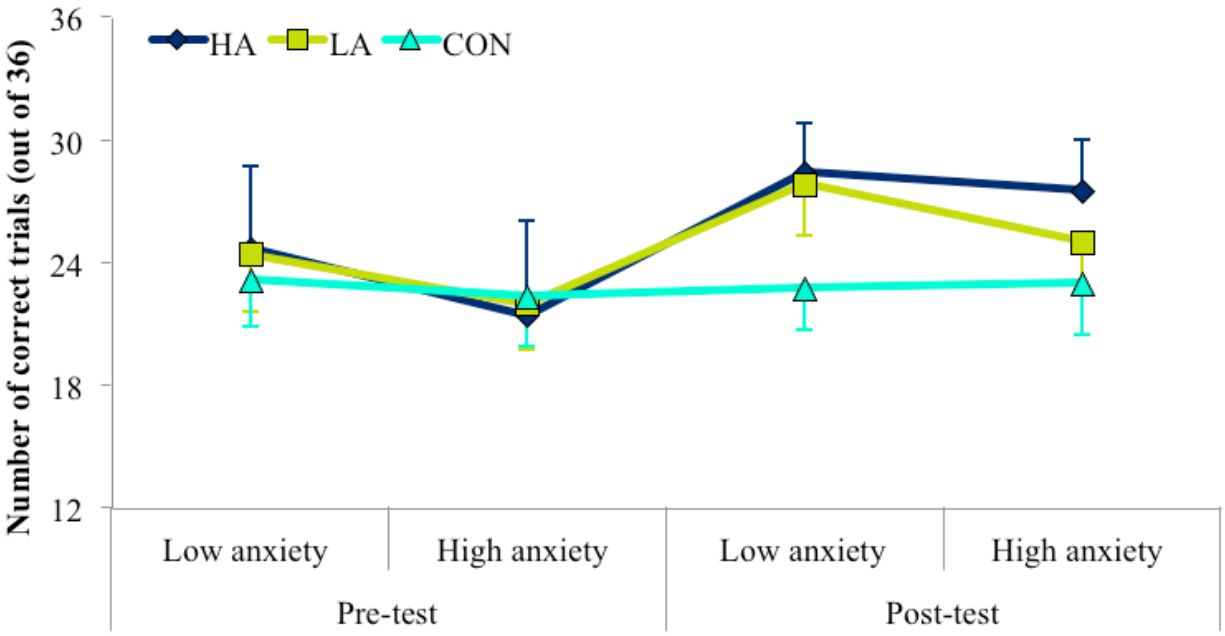

Figure 2. Mean (SD) anticipation judgment accuracy during the video-based tests as a function of group.

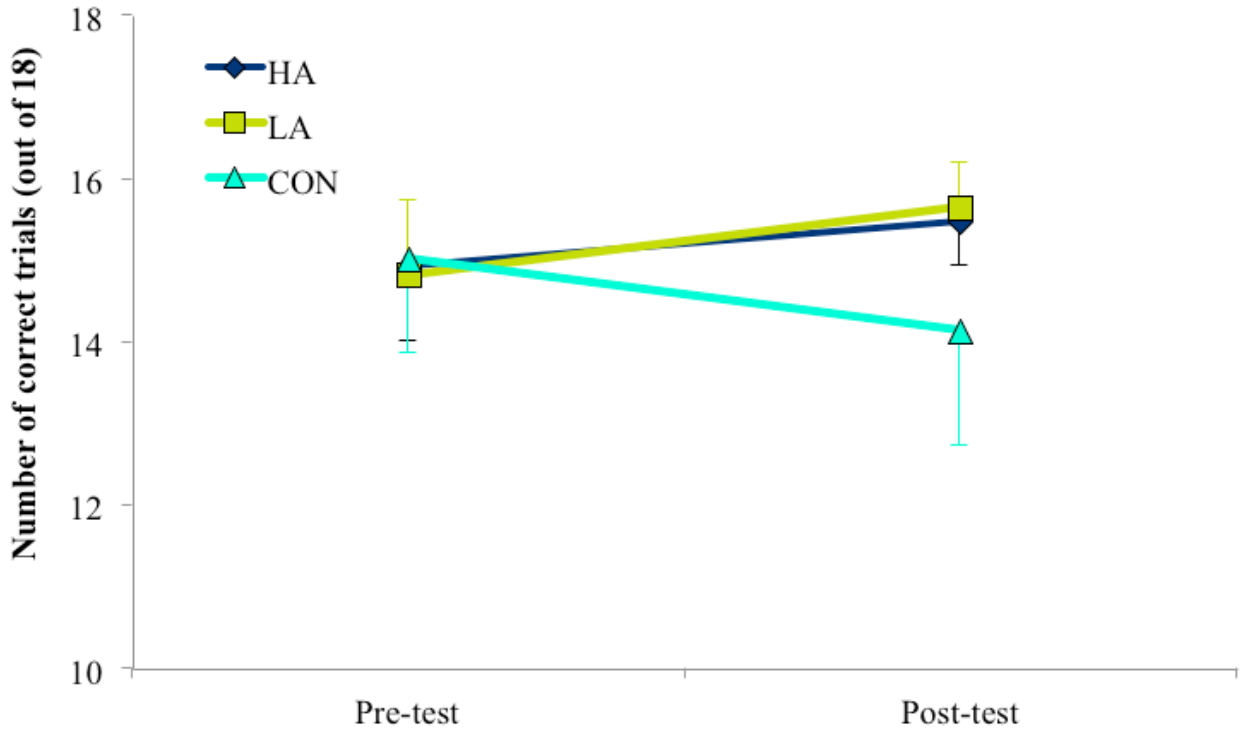

Figure 3. Mean (SD) anticipation judgment accuracy during the field-based tests as a function of group.

Discussion

Video-based simulation training led to the two training groups improving from pre- to post-test both the accuracy of anticipatory judgments and their visual search behaviours, as well as it transferring to improved on-court performance, supporting and extending previous research (e.g., Williams et al., 2002). The HA group that had completed the training alongside anxiety were able to maintain the accuracy of their anticipatory judgments in a transfer to a high anxiety condition, whereas the group who had trained under normal/low anxiety conditions could not, supporting and extending previous research (e.g., Causer et al., 2011). Data demonstrates how training under high-anxiety conditions allows athletes to acclimatise themselves to and develop strategies for the attentional and emotional demands of performing in these conditions.

Conclusion

Video-based simulation training lead to improved accuracy of anticipatory judgments in the field, whilst training under anxious conditions protected against its future negative effects.

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