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Discrimination Ability of Traditional and Action-Based Measures of Attentional Style in Sports

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ABSTRACT

Traditional and action-based measures were used to assess attentional styles of people varying in experience in team and individual sports. Undergraduates (24 men, 6 women) completed the Group Embedded Figures Test, the Rod-and-Frame Test, a standard target-throwing task, and a peripheral vision target-throwing task. The only significant correlation was between experience in team sports and performance on the peripheral vision target task, consistent with experienced players in team sports having better peripheral vision and an ability to distribute their attentional resources. These results imply that experienced players in team sports may be more field dependent than novices, and that an action-based measure has greater ecological validity and discrimination ability than traditional measures at determining their attentional style.

INTRODUCTION

Many researchers have attempted to determine the cognitive abilities of expert athletes, with the ultimate goal of improving training programs that would enhance those abilities in novice or less successful athletes. However, much of this research has yielded mixed results, particularly regarding the attention abilities of athletes in team and individual sports.

One body of research explores how athletes of varying skill levels differ on attentional style, as measured by the Test of Attentional and Interpersonal Style (TAIS; Nideffer, 1976). The TAIS includes attentional scales to measure whether individuals tend to have a broad or narrow external focus (i.e., distributed or narrowed attention on stimuli in the environment) and whether they possess a broad or narrow internal focus (i.e., distributed or narrowed attention on their own actions). In relation to sports performance, one might expect expert players in team sports to have a broad external focus, allowing them to attend to the position and activities of many offensive and defensive players simultaneously, which is crucial to selecting a successful plan of action. Unfortunately, research has failed to find any significant differences between good and bad decision makers (Vallerand, 1983) or between expert and novice players (Summers & Ford, 1990; Summers, Miller, & Ford, 1991; Wilson & Kerr, 1991), and subsequent research has shown that the TAIS lacks both reliability and factorial validity (Ford & Summers, 1992).

A second body of research explores the relation between expertise and the attentional style construct proposed by Witkin et al. (1954). According to Witkin et al., field-independent (FI) individuals process environmental information in an analytical manner, allowing them to focus their attentional resources on a specific object within a scene. This processing enables FI individuals to be less affected by distracting stimuli and to focus intently on the immediate task at hand. In contrast, field-dependent (FD) individuals have a propensity to distribute their attentional resources among multiple objects in their environment, and subsequently have difficulty in focusing on any single factor independent of the surrounding environment. In relation to Nideffer's (1976) attentional style construct, FI individuals would probably have a narrow external focus, whereas FD individuals would likely have a broad external focus.

Comparable to the hypothesis that expert players in team sports would possess a broad external focus, Kane (1972) argued that FD individuals would have the advantage over FI individuals in team sports. Researchers have assessed Witkin et al.'s (1954) attentional style construct with the Group Embedded Figures Test in which participants search for simple figures embedded within larger complex figures (Oltman, Raskin, & Witkin, 1971), and the Rod-and-Frame Test in which participants adjust a rod to a vertical position in the presence of a rotated square frame (Oltman, 1968; Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). Whereas most of these studies have found players in team sports to be more FD than players in individual sports (Bard, 1972; Barrell & Trippe, 1975; Cano & Marquez, 1995; Chu, 1988; Liu, 1996, 2003; McLeod, 1985; Pargman, Schreiber, & Stein, 1974; Raviv & Nabel, 1988; Taberner & Marquez, 1999; Wang, 1988), others have found no differentiation (Brady, 1995; Drouin, Talbot, & Goulet, 1986; Loader, Edwards, & Henschen, 1982; Raviv & Nabel, 1990).

What may be the reason for these contradictory findings? Some researchers have suggested that the discrepancy arises from an inconsistency in which the tests are administered, and that each of these measures differs in which aspects of the attentional-style construct are emphasized (Ravin & Nabel, 1990). Yet, the Group Embedded Figures Test has yielded both significant (Cano & Marquez, 1995; Pargman et al., 1974; Raviv & Nabel, 1988; Taberner & Marquez, 1999; Wang, 1988) and null results (Brady, 1995; Raviv & Nabel, 1990), and the Rod and Frame Test has yielded both significant (Bard, 1972; Barrell & Trippe, 1975; Chu, 1988; Liu, 2003; McLeod, 1985) and null results (Drouin et al., 1986; Loader et al., 1982).

Alternatively, the contradictory data may result from a lack of ecological validity of these tests. Although their reliability and validity have been well established for measuring processing in static environments (Witkin, Oltman, Raskin, & Karp, 1971), their data may not be accurately generalized to dynamic sport environments. This explanation has received support from research showing that an action-based measure of attentional style, based on performance of players on the basketball court, was better able to discriminate novice and expert players (Oberle, Doyen, & Morgan-Valdovinos, submitted). The present research explores whether a less sport-specific action-based measure of attention has greater discrimination ability than the traditional measures at revealing differences in attentional processes between novice and expert players in team and individual sports.

METHOD

Participants

The participants were 24 male and 6 female students recruited from an upper-division undergraduate psychology course at Texas State University. Their ages ranged from 19 to 31 years. Participants ranged in sports experience between 0 and 10 years playing competitively in team sports (e.g., basketball, football, soccer), and between 0 and 5 years playing competitively in individual sports (e.g., tennis, track, golf).

Design

This research assessed the correlation between the number of years of sports experience (in individual and team sports) and three different measures of attentional style (two standard measures and two action-based measures).

Materials and Procedure

Participants completed two standard measures of attentional style: the Rod-and-Frame Test (RFT; Oltman, 1968), and the Group Embedded Figures Test (GEFT; Oltman et al., 1971). In the RFT, participants completed 10 trials, in which they adjusted a rod to a vertical position in the presence of a square frame rotated 20 degrees to the right. The mean angular deviation of the rod from a perfect vertical served as their score. For this measure, higher scores represented FD processing, whereas lower scores approaching 0 represented FI processing. The GEFT included two sections of nine problems each, in which participants had to trace a designated simple figure within the larger complex figure provided. Participants were given five minutes to complete each section, and the total number of correctly traced simple figures served as their score. For this measure, higher scores approaching 18 represented FI processing, whereas lower scores approaching 0 represented FD processing.

Finally, participants completed two target-throwing tasks: a standard target task and a peripheral vision target task. For each, participants completed 20 trials, in which they threw a velcro-covered ball at the center of a velcro target placed on the wall at eye-level and 3m from the participant. For the standard task, participants focused on the center of the target while throwing the ball. For the peripheral vision task, participants focused on a dot on the wall that was 3m to the left of the center of the target. The mean distance from the ball to the center of the target served as the participant's score. For the peripheral vision task, lower scores represented

better performance and an ability to distribute attentional resources that is associated with FD processing; in contrast, higher scores represented worse performance and FI processing. The order in which the two target tasks were completed was counterbalanced across participants.

RESULTS

A series of Pearson correlation analyses were used to analyze the relationships between the number of years of competitive playing experience in team or individual sports, and the four different measures of attention (see Table 1 below). To minimize alpha inflation, a significance level of .042 was selected on the basis of the Bonferroni test ($[1 - .95^8]/8 = .042$). The only significant correlation was between experience in team sports and performance on the peripheral vision target throwing task, $r_{28} = -.46, p = .011$ (see Table 1), consistent with experienced players in team sports having better peripheral vision and an ability to distribute their attentional resources, an important aspect of FD processing. Neither the RFT scores nor the GEFT scores were correlated with experience in either team or individual sports. These results imply that experienced players in team sports may indeed be more FD than novices, and that an action-based measure has greater ecological and predictive validity than traditional measures at determining their attentional style.

Table 1

Correlations between Sports Experience and Performance on Measures of Attention Style

Attention Assessment	Team Sports	Individual Sports
Group Embedded Figures Test	-.05	.23
Rod and Frame Test	-.11	-.13
Standard Target Throwing Task	-.27	-.16
Peripheral Vision Target Throwing Task	-.46*	-.25

* $p < .05$

DISCUSSION

Kane (1972) argued that FD individuals would have the advantage over FI individuals in team sports, based on the assumption that the ability to attend to the position and activities of many offensive and defensive players simultaneously is crucial to successful decision making. To test this hypothesis, researchers in the past have examined the relationship between expertise and such measures as the GEFT (Oltman et al., 1971) and the RFT (Oltman, 1968; Witkin et al., 1962). Whereas most of these studies did find players in team sports to be more FD than either players in individual sports or nonathletes (Bard, 1972; Barrell & Trippe, 1975; Cano &

Marquez, 1995; Chu, 1988; Liu, 1996, 2003; McLeod, 1985; Pargman et al., 1974; Raviv & Nabel, 1988; Tabernero & Marquez, 1999; Wang, 1988), other studies found no differentiation (Brady, 1995; Drouin et al., 1986; Loader et al., 1982; Raviv & Nabel, 1990). Consistent with the latter findings, the present research found no relationship between experience in team sports and attentional style, as measured by the GEFT and the RFT. As mentioned previously, though, these inconsistent and conflicting findings may be due to the questionable validity of these tests. Although research supports the reliability and validity of these tests for measuring attentional processing in static environments (Witkin et al., 1971), the data may not be generalized to dynamic sport environments.

Findings from the present research support the discrimination ability of an action-based measure of attentional style based on an individual's performance on a simple peripheral vision target-throwing task. According to Witkin et al. (1954), FI individuals possess the ability to focus their attentional resources on a specific object within a scene, whereas FD individuals tend to distribute their attentional resources among multiple objects in their environment. Extending this construct to the target task, for FD individuals, we might expect the greater distribution of attentional resources to be associated with greater peripheral vision. Thus, if expert players in team sports are FD, we might expect more years of experience in team sports to be associated with more accurate performance on the peripheral vision target task. This correlation was found.

In summary, the present research suggests that an action-based measure of attention has greater discrimination ability than the traditional GEFT and RFT measures at revealing the differences in attentional processes between novice and expert players in team sports.

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