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Attention and Decision Making: A Test of the Predictive Validity of the Test of Attention and Interpersonal Style (TAIS) in a Sport Setting[1]

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The purpose of this study was to assess the relationship between athletes' attentional styles as measured by Nideffer's (1976 a, b) Test of Attentional and Interpersonal Style and a performance component, decision making. More making abilities and then divided into good, average, and poor decision makers. It was hypothesized that good, relative to average, and poor decision makers would display a more positive "scan" factor (higher BET, BIT, INFP scales) and a more adequate "focus" factor (low OET, and OIT, but high NAR scales). Results from the analyses of variance revealed no significant differences among the three groups. Furthermore, a discriminant analysis on the good and poor decision makers revealed no clear picture. The present results support Van Schoyck and Grasha's (1981) conclusion that the Test of Attentional and Interpersonal Styles does not seem to be sensitive enough to pick up differences in attentional style between performers of different levels.

Recently, a resurgence of interest in the role of personality variables in sport performance has been apparent (Morgan, 1980). In this vein, a personality variable which has generated much interest is that of attentional style (Nideffer, 1976a). Nideffer's (1976 a, b, 1981) theory posits that attention can be dichotomized in two dimensions. The first dimension extends itself on an internal-external continuum. That is, the focus of attention can be directed within the individual or at the external environment. The second dimension refers to the breadth of the focus and can be seen as varying on a narrow-broad continuum.

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Nideffer (1976 a, b, 1981) also proposed that individuals differ in attentional capabilities. For instance, certain individuals may have an attentional style which allows them to see the whole environment (broad-external focus) while others may not have successfully integrated such an attentional style. Nideffer (1976 a, b) has developed a personality inventory, the Test of Attentional and Interpersonal Style (TAIS), in order to assess those individual differences. The test contains 17 scales, 7 of which measure attentional styles. Four scales reflect one's attentional abilities. These scales assess to what extent individuals can attend to external (BET) and internal (BIT) cues, and to what extent they can effectively narrow their field of attention (NAR) and process incoming information (INFP). The other three scales reflect one's attentional deficiencies. More specifically, these scales indicate to what extent one is easily overloaded by external (OET) and internal (OIT) stimuli, and has a reduced attentional focus (RED).

In line with his theory, Nideffer (1978, 1979) has posited that one's attentional style is an important determinant of sport performance. For instance, according to Nideffer, given equal physical ability, a quarterback in football who can attend to many external cues and strategies (high BET and BIT, respectively) should be more successful than another quarterback who does not possess such attentional skills (low BET and BIT). Thus, to the extent that an appropriate attentional style appears to be an important determinant of sport performance, one can readily see the importance of assessing the relationship between attentional styles and performance. Yet, there has been a paucity of sport research in this area. The available empirical evidence (Nideffer, 1976a; Landers & Courtet, Note 1; Landers, Furst, & Daniels, Note 2) suggests that attentional differences seem to exist between good and poor performers. For instance, Nideffer (1976a) reported that poor swimmers are overloaded by external and internal stimuli (high OET and OIT, respectively) relative to good swimmers. Similarly, Landers et al. (Note 2) found that poor shooters (rifle, pistol, skeet, and trap) are overloaded by external stimuli (OET) and display an overly reduced focus of attention (RED) relative to good shooters. Thus, meaningful relationships between performance and attentional styles, as measured by the TAIS, appear to exist.

In a recent study, however, Van Schoyck and Grasha (1981) demonstrated that the TAIS did not differentiate among tennis players of three different skill levels. On the other hand, a more specific instrument devised by the authors, the Tennis-TAIS was found to differentiate between the skill levels. However, this was only true for what the authors call the "scan" factor (BET, BIT, INFP scales) and not for the "focus" factor (OET, OIT, NAR scales). Based on these results, Van Schoyck and Grasha advocated the use of the sport-specific TAIS over the general TAIS for future research in sport.

Three points deserve comments regarding Van Schoyck and Grasha's (1981) conclusion. First, as pointed out by these authors themselves, a sport-specific view of attentional styles has several negative implications. For instance, this means that a specific instrument has to be developed for all sports. This is extremely onerous. Furthermore, because dealing with instruments that are different although still closely related, it becomes difficult to compare results across sports and to generalize from results with sport-specific TAIS. Thus, there are definite drawbacks to the approach proposed by Van Schoyck and Grasha (1981).

A second point relevant to the present discussion is that while Van Schoyck and Grasha's position is firmly anchored in recent conceptualizations in the field of attention and cognitive psychology, the authors' suggestion is nevertheless based on only one study. There is a clear need for further research before accepting Van Schoyck and Grasha's (1981) research strategy. And third, perhaps there is a need to look at the relationship between the general TAIS and components of performance that demand attention and not overall performance alone. Van Schoyck and Grasha (1981) assessed the relationship between skill level and the TAIS. It may be asking too much of *one general* construct to predict overall performance. The TAIS, however, may be related to a component of performance such as decision making. While it is obvious that decision making (DM) and performance may not be equitable[2], it is also clear that DM represents an important performance component. Furthermore, since good DM necessitates appropriate treatment of information, it should be strongly related to one's attentional style. Finally, since DM may also be seen as a rather stable general ability, the relationship with a general measure of attentional style (TAIS) may be quite strong.

The definition of DM used in the present study was that DM is reflected in the ability to select the best option out of several alternatives, as judged by experts, irrespective of the outcome of such decision. This definition expresses two major concerns. First, this definition helps disentangle possible confusion between DM and athletic skills. In effect, the focus here is on the decision, not the outcome or result of such decision. Thus, a basketball player who correctly decides to make a pass, but because of a lack of precision throws it out of bounds, would still be considered as having demonstrated good DM. Conversely, the athlete who makes successful plays, but while not selecting the most appropriate decision, would not be considered as having demonstrated good DM.

The second concern that the above definition addresses is that of ecological validity. In line with recent work in cognitive psychology (Neisser, 1976) and perception in sports (Allard, Graham, & Paarsalu, 1980; Allard & Starkes, 1980), the present definition suggests that experts in sport can correctly identify key elements of a relevant sport situation and thus, decide on the most appropriate decision in that situation. More fundamental, however, is the contention that if we are to make advances in sport research related to DM it is precisely these experts we shall use in evaluating DM in sport. This is exactly what was done in the present study.

Thus, the purpose of this study was to assess the relationship between athletes' attentional styles as assessed by the TAIS and a performance component, DM, as assessed by experts. More specifically, the major goal was to ascertain if good, average, and poor decision makers in basketball differ in terms of their attentional styles. It was hypothesized that good, relative to average and poor, decision makers possess a more positive (higher scores) scan factor (BET, BIT, INFP) and a more adequate focus factor (low OET, OIT, but high NAR). Good decision makers were also expected to score lower than average and poor decision makers on the RED scale.

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[2]Indeed, one can imagine an athlete with good DM but poor physical ability. This could result in poor performance. On the other hand, one can also envision an athlete with outstanding athletic ability but poor DM. Again, this should result in less than optimal performance. One can readily see that the relationship between overall performance and DM is far from perfect. Nevertheless, DM appears to be an important component of performance, especially at higher levels of competition.

Method

Subjects

Male basketball players (N = 59) served as subjects. Subjects had a mean age of 18.62 years (SD = 2.21 yrs). Players came from four "AA" Cegep teams, one "AAA" team, and one university team. Cegep is approximately the same as junior colleges in the American educational system. Teams at the "AAA" level play in a tougher conference than "AA" teams. "AAA" teams are comprised of athletes of higher basketball ability than "AA" teams.[3] All players were French-speaking residents of the Province of Quebec. All players were in good health at the time of the study.

Task

The task consisted of three-on-two and two-on-one fast-break drills. These drills were selected because they involve continual decision-making situations. In the three-on-two situations, three offensive players come down the court at full speed against two defenders. The offensive player in the middle handles the ball and has to decide whether to pass the ball: (a) to his teammates on the right, (b) on the left, (c) to shoot from the foul line area, or (d) to penetrate for the lay-up. When the three-on-two is finished, other players come down toward the other basket in a two-on-one situation, in which two offensive players attack one defender. It is important to note that in either drill once the player has passed the ball to one of his teammates, this latter player is then in a decision-making situation. Thus, these two drills allowed for several ongoing decision-making opportunities. Drills were also arranged so that players were positioned according to where they play in games. This decision was made in order to reproduce game situations and thus, prevent judges from ascribing poor decision-making abilities to players simply being out of position. Players performed each drill for 10 minutes each. Finally, players engaged in a 10-minute scrimmage. This allowed judges to assess basketball players' decision-making abilities in five-on-five full-court situations. Thus, overall, judges were able to observe each player for 30 minutes in DM situations.

Questionnaire

Following practice, players responded to the TAIS.[4] Because French-speaking basketball players were employed in this study, the attentional scales (BET, BIT, OET, OIT, NAR, RED, INFP) of the TAIS were translated into French in line with procedures outlined in Vallerand and Halliwell (1983). More specifically, the TAIS was subjected to back-translation and committee approach procedures as proposed by these authors.

[3]A one-way analysis of variance performed on the DM score given by the experts revealed that players did not differ from each other as a function of team level, $F(2,56) = 1.27$, $p < .29$. Thus, this finding reinforces the view that DM was judged independently from basketball skills.

[4]Players also completed other questionnaires that were not relevant to the issues discussed in this paper.

Procedures

Early in the basketball season, a research team visited each of the six basketball teams at their respective schools. At the beginning of the session, players were told that they would take part in a study that had as its purpose the assessment of basketball players' reactions in DM situations. While players loosened up, cameras and adjacent video tapes mounted on high tables were installed and fixed at both ends of the floor. This procedure ensured that the entire action at both ends of the floor would be recorded.

Players then performed the three-on-two and two-on-one fast-break drills for a total of 20 minutes with a 5-minute break in between. Teams then went on with their regular practice until 10 minutes before the end, when they scrimmaged for 10 minutes. At all times during drills and scrimmage players wore jerseys of two different colors (black and orange) with large numbers on them. This facilitated players' identification.

After practice, there was a 5-minute break in which players could relax and drink water. Following the break, players were led into a classroom where they were told that the researchers were interested in finding out how basketball players generally think. Players were then told that they would be asked to answer a questionnaire. Instructions and directions regarding the test were provided. Confidentiality of results, especially as it regards feedback to the coach, was assured. Finally, the questionnaire was distributed. Answering the questionnaire took approximately 20 minutes.

A few weeks after the filming sessions, three basketball experts, who totalled more than 40 years of basketball involvement among them, met with the experimenters for the first time. The purpose of this first session was to explain the concept of DM as it specifically relates to basketball. The definition of DM was then presented. Special attention was given to clarify the difference between basketball skills and DM skills. Examples (similar to the ones provided earlier in this paper) reflecting this difference were provided. All three experts indicated that they clearly understood the DM definition and the distinction between DM and basketball skills. More important, however, experts indicated that this corresponded to their own definition of DM.

In order to assess the experts' reliability, it was decided to do a pretest in which the experts would have to rate basketball players' decision-making abilities. In order to do so, a high school basketball team was filmed in identical situations as the other teams. Experts were thus brought in a second time. Assessment of players' DM was made in the following manner. All three experts watched the tapes at the same time, comfortably seated in a large room. Experts were instructed not to talk to one another. Just before watching the tapes, the experts were again reminded of the definition of DM and of the basic distinction between basketball and DM skills. In line with the DM definition presented earlier, experts were specifically instructed to focus on the DM component irrespectively of performance. DM ratings were made on a 9-point scale anchored at one end by "Not very intelligent in play" and by "Very intelligent in play" at the other end.[5] In order to derive a final DM score for each

[5]The phrase "(not) very intelligent in play" was used as a synonym for (bad) good decision maker as it was thought to be easier to understand and referred to by the experts.

player, the following procedures were used. Each time a given player was in a DM situation, experts rated the quality of the decision on a 1 to 9 scale. Following watching the three drills, experts averaged each player's DM scores and thus obtained a single score for each player. Further, experts could also modify this score according to their overall subjective evaluation of each player's DM abilities. Finally, the three experts' scores were summed, yielding a final DM score for each player. This score could vary from 3 to 27. Experts' reliability was measured by the percentage agreement method (Kerlinger, 1973). A percentage agreement of 77% was obtained, thus showing raters' reliability.

Two weeks following the pretest, the experts met a third time with the experimenter to rate the six teams involved in the study. Tapes were viewed in two sessions lasting 3.5 hours each with a 2-hour break in between. Among the six teams, two were slightly superior to the other ones and were thus viewed first in order to control for a ceiling effect. The other four teams were presented in a random order. The experts always watched drills in this increasing order of difficulty: two-on-one, three-on-two, and scrimmage situations, and could watch the tapes as much as they wanted. Assessment of players' DM was made in the exact same way as in the pretest.

Results

Manipulation Checks

Judges' Reliability. Experts' reliability was assessed in two fashions. First, the percentage agreement among experts was performed as in the pretest. An 88.8% overall agreement was obtained. Second, a Cronbach's alpha was performed on the experts' scores. This allowed the calculation of the internal consistency of the three experts. The analysis yielded an .84 α. Thus, it appears that the experts were very reliable.

French TAIS. In order to assess the similarity of the French and English versions of the TAIS, interscale correlations as well as the results of a factor analysis (principle component analysis with a varimax rotation) on the attentional scales were compared to the results of such analyses reported by Van Schoyck and Grasha (1981). The comparison for the correlations is presented in Table 1 while the comparison for the factor analysis results are presented in Table 2. Overall, these comparisons reveal a high level of similarity between the structures of the French and English versions of the TAIS. Results from the factor analysis are very similar. Both analyses reveal a three factor solution. The only differences worth noting is that in the present study, NAR loaded on the scan factor (with BET, BIT, and INFP), while in the Van Schoyck and Grasha study it loaded on the focus factor (with OET and OIT) and that factor 2 explained more variance in the Van Schoyck and Grasha (1981) study while in the present study factor 1 did. Thus, both the English and French versions of the TAIS present similar structures. This provides further validity for the French TAIS. Results of the analyses conducted with the instrument can thus be interpreted with confidence.

Decision-making Groups. Good and poor decision makers were obtained by selecting the upper and lower quartiles of the DM scores distribution, respectively. This was done in order to maximize differences between groups and thus allow differences on the TAIS to come out. Because some players had the same score, this

Table 1

Comparison between the TAIS Interscale Correlation of the Van Schoyck and Grasha (1981) Sample[1] (n = 90) and the Present Sample (n = 59)

	BET	OET	BIT	OIT	NAR	RED	INFP
BET	----	(−.33)*	(.44)*	(−.20)**	(.22)**	(−.29)*	(.53)*
OET	−.21**	----	(−.37)*	(.75)*	(−.69)*	(.27)*	(−.14)
BIT	.49*	−.20	----	(−.20)**	(.31)*	(−.34)*	(.73)*
OIT	−.22**	.58*	−.13	----	(−.67)*	(.23)**	(−.05)
NAR	.15	−.28**	.54*	−.28**	----	(.03)	(.01)
RED	−.19	.25**	−.38*	.45*	.06	----	(−.43)*
INFP	.31*	−.12	.68*	.03	.40*	−.05	----

[1]Interscale correlations from the Van Schoyck and Grasha (1981) sample are in parentheses.

*$p < .01$

**$p < .05$

Table 2

Comparison of Factor Analysis Results for the Van Schoyck and Grasha (1981) Sample (n = 90) and the Present Sample (n = 59) on the TAIS Scales

	Present Sample Factors			Van Schoyck and Grasha (1981) Sample Factors		
Scale	1	2	3	1	2	3
BET	.41	−.15	−.22	−.20	.53	−.16
OET	−.15	.63	.09	.84	−.20	.23
BIT	.95	−.08	−.28	−.22	.77	−.07
OIT	−.01	.87	.26	.82	−.03	.24
NAR	.59	−.39	.35	−.88	.17	.32
RED	−.13	.29	.69	.10	−.34	.56
INFP	.67	.01	.04	.09	.95	−.24
Eigenvalues*	2.68	1.54	1.02	3.99	1.81	0.82
Pct of Variance	38.3	22.0	14.5	44.2	25.9	11.8
Cum Pct	38.3	60.2	74.8	44.2	70.1	81.8

*Eigenvalues, percent of variance and cumulative percent are taken from the unrotated factor solution.

Note: Factor 1 and 2 in the present sample corresponds to Factor 2 and 1, respectively in the Van Schoyck and Grasha study.

Table 3

Scale Scores and ANOVA Results for the Basketball Players on the TAIS as a Function of Decision Making Level

Variable	Poor (n = 13)		Average (n = 30)		Good (n = 16)		ANOVA F
	M	*SD*	*M*	*SD*	*M*	*SD*	
DM Score	11.62	1.04	15.30	1.18	19.25	1.24	154.77*
BET	22.00	3.61	21.70	2.72	21.75	2.96	0.05
OET	28.54	9.29	31.13	4.33	31.69	5.51	1.13
BIT	27.23	4.59	26.83	3.94	26.44	3.81	0.14
OIT	24.46	4.89	22.03	4.19	22.13	4.08	1.56
NAR	38.0	5.60	38.03	4.30	38.44	5.34	0.04
RED	43.46	6.70	41.63	4.85	41.88	5.52	0.53
INFP	61.54	6.02	56.93	11.83	59.25	5.51	1.14
Scan Factor	110.77	12.44	105.47	14.18	107.44	11.09	0.75
FOCUS Factor	15.00	15.75	15.13	11.33	15.38	12.95	0.00

Note: Degrees of freedom for the ANOVAs are 2 and 56.
*$p < .0001$

yielded unequal n's of 16 (Good DM) and 13 (Poor DM). Players whose score fell in between these two extremes formed the average DM group. In order to determine if the three DM groups differed from one another, a one-way ANOVA was performed. The means, standard deviations, and results of the analysis are presented in Table 3. Inspection of Table 3 reveals that all three groups differed significantly from each other on the DM scores accorded by the experts, $F(2,56) = 154.75, p < .0001$. Thus, the three DM groups were correctly classified.

TAIS and Decision Making

In order to determine if the three DM groups differed on the TAIS scores, one-way ANOVAs were conducted. Results showed no significant differences among the three groups. ANOVAs were also performed on the algebraic sum of the BET, BIT, INFP scales (scan factor) and the total of OET + OIT − NAR (the focus factor). Again no differences emerged (see Table 3). Thus, no significant differences were found between the three groups in terms of their attentional styles.[6]

Finally, in order to determine if the TAIS scales could discriminate between the good (n = 16) and poor (n = 13) decision makers, a discriminant analysis was performed. The results of this analysis revealed that only two scales, OET and OIT were included in the significant equation, Wilks $\lambda = .73$, $\chi^2(2) = 8.04, p < .02$. The group centroids were .64 and −.52 for the poor and good decision makers, respectively. These results indicated that the OIT (standardized coefficient = 1.25) and OET (1.20) scales maximized differences between the two groups of decision makers with 68.97% of the subjects being correctly classified. The interpretation of these results is ambiguous, however. In effect, good, relative to poor, decision makers reported being less overloaded by internal stimuli (OIT), but more overloaded by external cues (OET).

[6]These analyses were also performed while using the number of years of basketball experience as a covariate. In line with the results reported here, no significant differences emerged between the three groups.

Discussion

The purpose of this study was to assess the relationship between attentional style, as measured by the TAIS (Nideffer, 1976 a, b) and a performance component, DM. It was hypothesized that good, relative to average and poor, decision makers would score higher on the BET, BIT, NAR, and INFP scales, but lower on the OET, OIT, and RED scales. Results from the ANOVAs revealed no significant differences among the three groups on these variables. Furthermore, results of the discriminant analysis performed on the good and poor decision makers revealed a rather ambiguous picture. While it was found that OIT was a characteristic of poor DM, OET was found to be more of a characteristic of good DM. Thus, the hypotheses were not supported; overall, no meaningful and consistent relationship appears to exist between attentional style as measured by the TAIS and DM.

One could raise the issue that accepting the null hypothesis in the present study may be due to the TAIS being in French (and possibly being different from the English version) and to the basketball experts who may have made errors in judging athletes' DM. However, this seems unlikely. In effect, results from the interscale correlations and the factor analysis on the French TAIS revealed that its structure was quite similar to the English version as reported by Van Schoyck and Grasha (1981). Thus, this rival hypothesis is ruled out as a possible explanation of the present findings. Similarly, the experts used in this study shared among themselves more than 40 years of basketball experience. Furthermore, reliability analyses revealed that they were quite reliable in their analysis of DM. It thus seems unlikely that they would err in the judgment of athletes' DM. Overall, it appears that the conclusion that the TAIS does not predict DM is justified.

Results from the present study conceptually replicate Van Schoyck and Grasha's (1981) findings obtained with tennis players, in that basketball players of different DM levels did not differ on the TAIS. Thus, the present results support Van Schoyck and Grasha's position that the TAIS does not seem sensitive enough to detect differences in attentional style between performers of different skill levels. Consequently, the findings of this study, coupled with those of Van Schoyck and Grasha (1981), cast some doubts regarding the usefulness of the TAIS as a sport performance predictor in its present form.

An obvious direction for future research is to attempt to replicate the present findings in other sports. Findings from the present study, as well as that of Van Schoyck and Grasha (1981), reveal a rather bleak picture of the predictive validity of the TAIS in sport. A definitive decision regarding the usefulness of the TAIS in sport, however, must await future research.

Should the present findings be supported by future research, however, then two directions of future research would seem logical for sport researchers. A first direction, which emanates from the work of Van Schoyck and Grasha (1981), would

consist of revising the TAIS to make it more specific to sport. However, the author does not concur with Van Schoyck and Grasha's (1981) conclusion that a TAIS should be constructed for every sport. Because of the interpretation and generalization problems such a position entails, it is suggested that we should not get that specific in the reformulation of the TAIS. Rather, it appears more useful that an instrument which makes reference to sport in general, rather than to a given sport, be developed and used in future attention research. Such a research approach would have the advantage of using an instrument more sport specific than the general TAIS (Nideffer, 1976 a, b), while allowing for comparison and generalization across sports without confusion and interpretation problems.

A second possible direction for future research is much more fundamental and deals with Nideffer's theory of attention. Nideffer's TAIS may not be a good predictor of sport performance because it may be based on an incomplete theoretical statement. Etzel (1979), for instance, convincingly argues that several components of attention are neglected in Nideffer's conceptualization. Etzel (1979) suggests that in addition to Nideffer's internal-external continuum and broad-narrow breadth of focus the following dimensions must be considered in order to fully account for attention in sport: (a) attentional intensivity or conscious sensitivity to task-related stimuli (e.g., Keele, 1973), (b) attentional selecting of only appropriate stimuli (e.g., Kahneman, 1973), (c) duration of attention to specific task-related stimuli, and (d) the amount of attentional capacity used to perform a given task. Future research and theorizing should attempt to form a more complete approach in its study of attention in sport than that proposed by Nideffer. This could be attained by combining Etzel's suggestions to already well-formulated models of attention such as those of Wachtel (1967) and Treisman and Gelade (1980), and to Nideffer's theory. Once a general model is formulated it should prove easier to devise an instrument assessing individual differences in sport attentional skills. This in turn, could lead to a better prediction of sport performance than Nideffer's TAIS.

In conclusion, the present results do not support the predictive validity of Nideffer's TAIS in sport settings. It is suggested that future attention research be more sport specific. This could be achieved in two fashions: (a) a revision of the TAIS scale for sport in general, and (b) a formulation of a more complete theoretical statement on attention in sport than Nideffer's theory. This more complete theory could then lead to the construction of an instrument to assess individual differences in attention in sport. While both of these research directions would appear fruitful, it is believed that the latter one may ultimately lead to more long-term benefits. Indeed, it could lead to a more thorough understanding of attention as it can be found in sport and eventually to a better prediction of sport performance.

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