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REACTION ABILITY AS A PREDICTOR OF ATTENTION CONTROL IN SPORTS

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ABSTRACT

The study aimed to determine the relationship between reaction ability and attention control of team sports players and determine whether attention control can be predicted based on different types of reaction ability. For that purpose, twenty-two (22) cricket players, eighteen (18) handball players, and nineteen (19) football players, a total of fifty-nine (59) district-level sportspersons, were selected. The attention control was assessed through the Attention Control Scale (ATTC), and the auditory, visual, and tactile reaction time was assessed through a ruler drop test of all the sports persons. The multiple Correlation (R=.404) shows a significant relationship between attention control and auditory, visual, and tactile reaction time. Based on the regression analysis, it was concluded that the regression model is effective, and 16.30% attention control can be estimated on the basis of auditory, visual, and tactile reaction time.
Keywords: *Attention control, reaction time, prediction, regression model.*

1. INTRODUCTION

Athletic performance is characterized by various physical, physiological, psychological, anthropometrical, health-related, and skill-related parameters, which differ individually (Blume & Wolfarth, 2019). So, research in these particular fields is very much required. The research result would help in planning out the strategies to cope with the physical and psychological health of the athletes (Sabato et al., 2016). Various psychological parameters like emotion, cohesion, confidence, mindfulness, anxiety, depression, etc., play an essential role during sports performance (Lochbaum et al., 2022), so research in sports psychology is the need of the hour.

Faster Reaction ability, i.e., how fast an individual responds to a particular stimulus, and high-performance athletes possess better reaction ability (Atan & Akyol, 2014; Mohammad, & Tareq, 2016;). Research proved that sprinters are good at auditory reaction time, and volleyballers are good at anticipation (Mohammad, & Tareq, 2016; Nuri et al., 2013). More importantly, reaction time has a much more significant impact on sports played within a short area (Subramanyam, Jamuna, & Kalavathi, 2016).

Attention control is the ability of an individual to focus on his/her main task (Roychoudhury, 2023). Attention control is related to internal or external focus and broader or narrower focus. Better attention control improves cognitive control during sports performance, which ultimately helps an athlete perform better in motor skills (Neumann, 2019). So, it is clear from the above facts that reaction ability and attention control are essential in sports performance (Team, 2021; Rahimi, Roberts, Baker, & Wojtowicz, 2022). Reaction time and attention control are both required by the sports persons participating in

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different sports like badminton, sprints, basketball, volleyball, football, etc., depending on the motor and mental skills involved (Subramanyam, Jamuna, & Kalavathi, 2016).

The study's primary purpose was to determine the relationship between reaction ability and attention control of team sports players. Further, the researchers also wanted to determine whether attention controls could be predicted based on three different kinds of reaction time, i.e., auditory, visual, and tactile.

2. METHODS AND MATERIALS

1.1 Participants

For the study, fifty-nine (59) district-level sports persons were selected through purposive random sampling from Gushkara Mahavidyalaya, Burdwan, West Bengal, India. Among them, twenty-two (22) were cricket players, eighteen (18) were handball players, and nineteen (19) were football players. The age of the participants ranged from 20 to 25 years.

1.2 Criterion Measures

By glancing the available literatures, the following variables were selected as the criterion measures (see table 3) to establish the relationship between reaction ability and attention control of team sports players.

Table 1: Criterion Measures

Variables	Tools	Scoring
Dependent Variable		
Attention Control	Attention Control Scale (ATTC) (Derryberry & Fajkowska, 2010)	Number of Points
Independent Variables		
Auditory Reaction Time (ART)	Ruler Drop Test (Aranha et al., 2015)	Time in Seconds
Visual Reaction Time (VRT)		
Tactile Reaction Time (TRT)		

1.3 Design of the Study

The study aimed to determine the relationship between reaction ability and attention control of team sports players and determine whether attention control can be predicted based on different types of reaction ability. After selecting the sports persons through the purposive random sampling technique, the purpose of the study was explained to them, and written consent and willingness were taken from them. The dependent variable, attention control, was assessed through the Attention Control Scale (ATTC) (Derryberry, & Fajkowska, 2010).

The independent variables, i.e., auditory, visual, and tactile reaction time, were assessed through a ruler drop test (Aranha, Joshi, Samuel, & Sharma, 2015) of all the sports persons selected for this study. ATTC consists of twenty (20) items, which measure two components of attention, i.e., attention focusing and attention shifting. The responses were collected on a four-point Likert scale from 1 (almost never) to 4 (always). The total attention control was calculated by summing up the scores of all the twenty items. The reaction time was calculated by using the formula $t = \sqrt{(2d / g)}$, where 'd' is the distance the ruler fell in meters, 'g' is the acceleration of gravity (9.8 m/s2), and 't' is the time the ruler was falling (seconds).

1.4 Statistical Tools Used

All the statistical analysis has been done through SPSS Statistical Tools. The descriptive analysis was done by calculating mean, standard deviation, range, skewness, kurtosis, etc. The Product Moment Correlation Coefficient method was applied to determine the relationship between dependent and independent variables. The Regression Analysis was done to determine whether the dependent variable, i.e., attention control, can be predicted on the basis of three independent variables, i.e., ART, VRT, and TRT. The statistical significance has been tested at 0.05 levels.

3. RESULTS

Table 2: Descriptive Statistics of Dependent and Independent Variables

Variables	Mean	SD	Min.	Max.	Range	Skewness	Kurtosis	SE
Attention Control	51.93	6.13	41.00	71.00	30.00	.477	-.028	.79847
Auditory Reaction Time	.1657	.0116	.14	.19	.05	.226	-.796	.00151
Visual Reaction Time	.1649	.0115	.14	.19	.05	.313	-.346	.00150
Tactile Reaction Time	.1674	.0119	.14	.20	.06	.465	.131	.00155

Table 2 shows the descriptive statistics regarding the selected dependent and independent variables' mean, standard deviation, range, etc. The skewness score of all the variables ranges between -2 to +2, and the kurtosis scores range between -7 to +7, which indicates that all the scores are normally distributed (Byrne, 2013; Hair et al., 2010).

Table 3: Residuals Statistics for checking outliers

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	47.6098	58.7136	51.9322	2.47632	59
Residual	-10.08334	18.48345	.00000	5.61105	59
Std. Predicted Value	-1.746	2.738	.000	1.000	59
Std. Residual	-1.750	3.208	.000	.974	59

a. Dependent Variable: ATC

Table 3 shows that standardized (std.) residual, max value (3.208), and min value (-1.750), both values don't exceed +3 & -3, which indicates that the range doesn't have any outliers.

Figure 1: Normality Curve of Attention Control

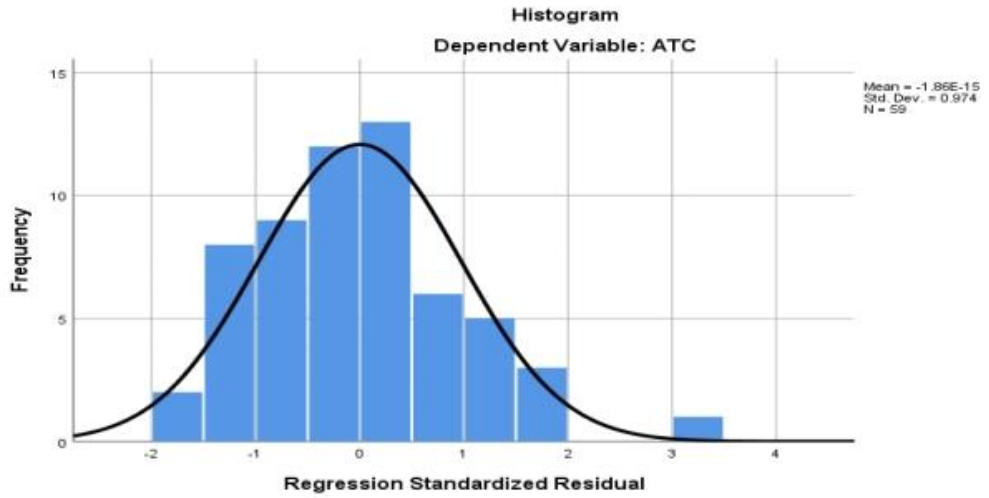

Figure 2: Normality probability plots of Attention Control

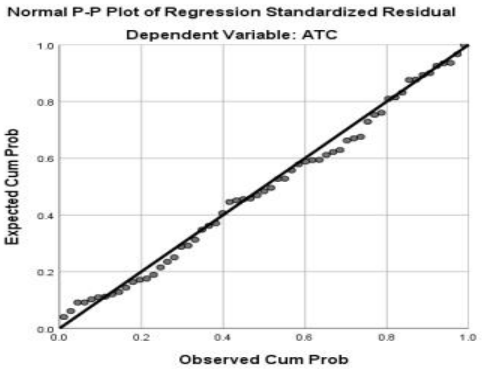

Table 4: Correlation between dependent variable (ATC) and independent variables (ART, VRT & TRT)

Variables	N	Correlation Coefficient (r)	Sig. Value
Auditory Reaction Time (ART)	59	.278*	.033
Visual Reaction Time (VRT)	59	.350**	.007
Tactile Reaction Time (TRT)	59	.303*	.020

*Statistically Significant at 0.05 Level
** Statistically Significant at 0.01 Level

Table 4 indicates the significant positive relationship between ART and TRT with ATC at 0.05 levels, as the significant values are less than 0.05. In contrast, a significant positive relationship is also found between VRT and ATC at 0.01 levels, as the significant value is less than 0.01.

Table 5: Model Summary showing correlations between Dependent (ATC) and selected independent variables (ART, VRT & TRT)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.404[a]	.163	.117	5.76204	.163	3.571	3	55	.020	1.858

a. Predictors: (Constant), TRT, VRT, ART
b. Dependent Variable: ATC

Table 5 shows multiple correlations between ATC and selected independent variables. It is found that the dependent variable ATC is positively correlated (R= .404) with the independent variables (ART, VRT & TRT). The R Square value .163 indicates that the dependency of ATC is 16.3% on ART, VRT & TRT.

Table 6: The ANOVA table of the linear regression model about Attention Control based on selected independent variables (ART, VRT & TRT)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	355.666	3	118.555	3.571	.020[b]
	Residual	1826.063	55	33.201		
	Total	2181.729	58			

a. Dependent Variable: ATC
b. Predictors: (Constant), TRT, VRT, ART

The above ANOVA table (Table 6) shows the effectiveness of the above-mentioned linear regression model. This model was effective while estimating attention control based on the selected independent variables, namely auditory, visual, and tactile reaction time, as the F value 3.571 is found significant ($p<0.05$).

Table 7: Regression coefficient of selected variables in predicting dependent variable (Reaction Ability)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	8.379	13.520		.620	.538	-18.716	35.474
	ART	24.254	93.530	.046	.259	.796	-163.184	211.693
	VRT	145.006	71.544	.273	2.027	.048	1.628	288.383
	TRT	93.274	89.069	.181	1.047	.300	-85.224	271.772

a. Dependent Variable: ATC

The above table quantifies the relationship between selected independent variables, namely auditory, visual, and tactile reaction time with attention control. With increases of every one unit of auditory, visual, and tactile reaction time, the attention control (on average) increases by 24.254, 145.006, and 93.274 units, respectively. The constant 8.379 gives the value of attention control when these variables (ART, VRT & TRT) are equal to zero (0).

Regression model for estimating Attention Control based on selected variables
Model 1: Y = 8.379 + 24.254 (X1) + 145.006 (X2) + 93.274 (X3)

Where: *Y= Attention Control, X1= Auditory Reaction Time, X2 = Visual Reaction Time, X3 = Tactile Reaction Time.*

So, the regression model is:

Attention Control = 8.379 + 24.254 (Auditory Reaction Time) + 145.006 (Visual Reaction Time) + 93.274 (Tactile Reaction Time).

4. DISCUSSION

The study's primary purpose was to determine the relationship between reaction ability and attention control of team sports players and whether attention control can be predicted based on different types of reaction ability. The findings and the statistical analysis show a significant relationship between attention control and three other reaction times, i.e., ART, VRT, and TRT. The researchers would like to attribute a few reasons behind such kinds of findings.

Attention capacity is a part of various executive functions (Ardila, 2018), and it depends on the intellectual behavior of human beings (Chan et al., 2008). The brain controls this executive function, attention capacity (Kerr & Zelazo, 2004), and neural functions (Bernabéu, 2017). On the other hand, reaction ability is the ability of an individual to respond to a particular stimulus that comes through the neurons (Mohammad, & Tareq, 2016; Uiritzikiri & Alicia, 2018) to the cerebral cortex of the brain (Huerta Ojeda et al., 2022).

So, it is clear from the facts mentioned above that the human's neuronal and brain functions control both attention capacity and reaction ability. This might be the reason behind the significant relationship between attention control and reaction time of team sports players in this present study. This present study's findings align with the findings of some previous research conducted by Huerta Ojeda et al. (2022), who concluded that reaction time

influences attention capacity. Another research finding (Prinzmetal et al., 2005) also supports the present research findings.

5. CONCLUSION

Based on the statistical analysis and findings, the following conclusions were drawn:

- Auditory, visual, and tactile reaction time is significantly related to attention control.
- Multiple relationships (R) between attention control and selected independent variables (ART, VRT, and TRT) is R = 404 and R square is .163, which shows 16.30% of attention control is obtained by these independent variables, i.e., ART, VRT, and TRT.
- The regression model Attention Control = 8.379 + 24.254 (Auditory Reaction Time) + 145.006 (Visual Reaction Time) + 93.274 (Tactile Reaction Time) was found to be effective in estimating attention control based on auditory, visual, and tactile reaction time.

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