

**KINEMATIC FACTORS AFFECTING THE SCORE IN ARCHERY: USING SEM**

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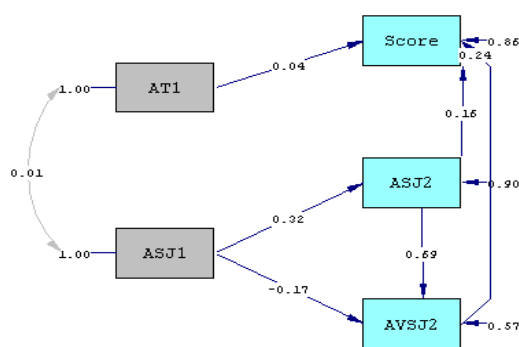
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**KEY WORDS:** Structural equation modelling, Archery, Multiple linear regression

**INTRODUCTION:** The shooting movements of Archery are paths of continuous and causal movements. **Structural equation modeling (SEM)** grows out of and serves purposes similar to multiple regression and may be used as a more powerful alternative to multiple regression, path analysis, factor analysis, time series analysis, and analysis of covariance. Some researchers in marketing have used SEM to analyze data deprived from experiments (e.g., Mackenzie, Lutz, and Belch, 1986; Ryan, 1982). The purpose of this study was to investigate the structural equations between kinematic factors affecting score during back-tension which was basic and important in archery

**METHOD:** A male subject (21yrs, 82kg, 185cm) is the second archer ranked in the world authorized by FITA. 60 shootings were captured with seven infrared cameras (MCU-240, Qualisys Inc., Switzerland) and SEM (DoG=4, Size=60) of data was analyzed with LISREL 8.80.

**RESULTS:**



**Table 1 Goodness of Fit Statistics**

Index	Acceptable Level
Minimum Fit Function Chi-Square = 5.15 (P = 0.27)	>.05 (good)
Goodness of Fit Index (GFI) = 0.97	> 0.90 (good)
Adjusted Goodness of Fit Index (AGFI) = 0.88	>0.85-0.90 (good)
Non-Normed Fit Index (NNFI) = 0.93	>0.9 (good)
Normed Fit Index (NFI) = 0.89	> 0.90 (not bad)

**Figure 1. Path Diagram**

**Structural Equation:**  $ASJ2 = 0.32 * ASJ1$ , Errorvar.= 0.90,  $R^2 = 0.10$

Standard error: (0.13) (0.17)  
 t-value: **2.55** 5.34

$AVSJ2 = 0.69 * ASJ2 - 0.17 * ASJ1$ , Errorvar. = 0.57,  $R^2 = 0.43$

Standard error: (0.11) (0.11) (0.11)  
 t-value: **6.54** -1.58 5.3

**DISCUSSION:** Model being tested was accepted by means of GoFS, and ASJ1 (Angle of scapular joint during phase1:anchoring-release) and AVSJ2 (Angular velocity of scapular joint during phase2:release-follow through) are statistically significant ( $t > 1.96$ ) above two equations.  $Y(ASJ2) = 0.32 * X1(ASJ1)$  and  $Y(AVSJ2) = 0.69 * X1(ASJ2) - 0.17 * X2(ASJ1)$  are significant equations. SEM can be used to analyze experimental data and is a useful tool for various analyses.

**REFERENCES:**

Richard P. Bagozzi & Youjae Yi (1989), On the Use of Structural Equation Models in Experimental Designs, *Journal of Marketing Research*, 26, 3, 271-284.