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Comparison of Reaction Ability among District, State and University level Male Hockey Players.

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Abstract:

The primary aim of this report was to determine the reaction skills of male hockey players from district, state, and university levels. 54 male hockey players (18 from each competitive level) were randomly selected from several hockey clubs and academies in Bangalore. The Ball Reaction Exercise Test, which measures an athlete's speed and accuracy in responding to a moving stimulus, was used to determine reaction skills. ANOVA (ANOVA) was used to investigate differences in reaction skills among the three groups. Mean reaction scores varied by a statistically significant difference ($F(2,51) = 5.40$, $p = 0.007$)). According to a post-hoc review, university-level students scored significantly higher than district-level players ($p = 0.006$), although differences between state-level players and the other two groups were not statistically significant. The state-level players displayed the highest degree of variability in scores, possibly indicating the lack of significant differences among the two groups. These results show that higher competitive skills are associated with improved reaction capability, with university-level players outperforming district level players. The research highlights the importance of reaction control in hockey success and recommends further study to identify factors that influence variability within competitive settings.

Hockey, Reaction skills, Ball simulation exercise, ANOVA and Post-hoc are the keywords.

Introduction:

Hockey is a fast-paced sport that requires players to possess high levels of physical fitness, technical skill, and mental sharpness. Among the various factors contributing to success in hockey, reaction control is a crucial element. Reaction capability refers to a player's ability to respond quickly and accurately to external stimuli, which is essential in a game where athletes must continuously track and react to changing conditions, opponent movements, and the ball's trajectory. The significance of quick reactions in hockey cannot be overstated—whether it's intercepting a pass, making a save as a goalkeeper, or initiating a rapid counterattack, reaction time can be the deciding factor between winning and losing. Reaction time is closely linked to other motor skills such as agility, coordination, and speed, and is often viewed as an indicator of an athlete's neuromuscular

endurance and cognitive processing speed. As players advance from district to university levels, their reaction skills generally improve. District-level players are typically in the early stages of athletic development, focusing on mastering basic skills and game understanding. State-level players, chosen for competitive play, receive more intensive training and exposure to higher competition levels, which help enhance their reaction abilities. University-level players, representing the highest amateur level, are expected to possess outstanding technical, emotional, and reaction skills to compete effectively. Both natural factors and systematic training impact reaction time. Research shows that consistent exposure to high-intensity, game-like scenarios and specialized reaction training can significantly improve an athlete's response speed. Therefore, comparative studies are valuable for assessing the effectiveness of training methods across different competitive tiers.

Methodology

The primary aim of this report was to determine the reaction capabilities among male hockey players at district, state, and university levels. For this research, a total of 54 male hockey players were chosen as participants. The sample consisted of 18 district-level, 18 state-level, and 18 University-level players in Bangalore; each participant was chosen randomly from various hockey clubs and academies, ensuring representation from every competitive level. The selected participants were actively playing in their respective clubs/academies and representing their respective leagues/academies as well as representing their national championships. All participants were required to have a consistent training history appropriate for their level, as required by the inclusion criteria. All participants were tested for reaction control using the Ball Reaction Exercise Test to determine reaction skills. This questionnaire is designed to assess an athlete's ability to respond quickly and accurately to a moving stimulus, which is a vital skill in hockey.

Statistical Process

A Way Analysis of Variance (ANOVA) was used to see if there were significant differences in reaction abilities among district, state, and university-level male hockey players. Each individual underwent the Ball Reaction Exercise test to determine their reaction capability after the sample was chosen. The scores were determined using the test's standardized scoring scheme. According to the three categories, district, state, and university-level players, the results were compiled and tabulated after all data had been collected. If the ANOVA revealed a significant difference, post-hoc tests (such as Tukeys HSD) could be used to determine which particular groups differed from each other, and the degree of significance was set at 0. 05.

Interpretation and Result

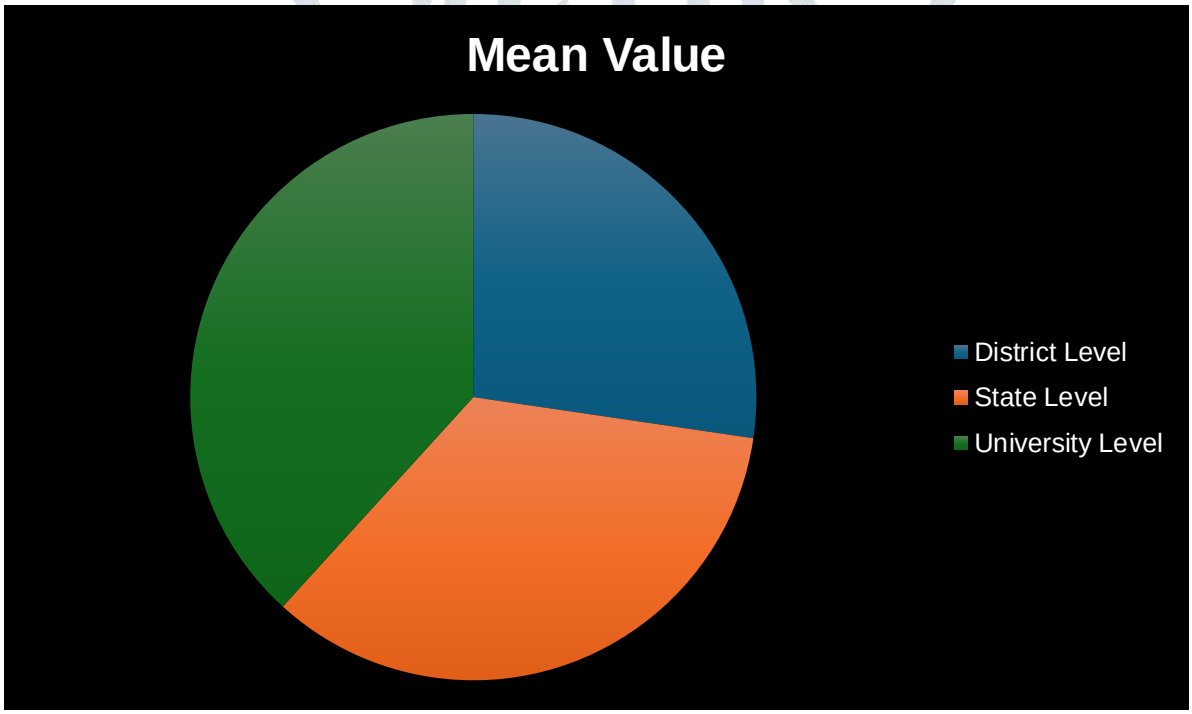
Table 1

Mean and Standard Deviation of variables of **Reaction ability**among district, state, and university level male hockey players.

Nature of level	District Level	State Level	University Level
Mean Value	6.65	8.38	9.31
Std. Dev.	2.05	2.90	2.37
Std. Error	.48	.68	

Table one shows mean and standard deviation value of **Reaction ability** among district, state, and university-level male hockey players

Graph Representation of **Reaction Ability**



Graph-1

Table 2

One-way ANOVA for **Reaction ability** among district, state, and university level male hockey players

Source	Sum of squares	Degree of Freedom	Mean square	'F' ratio	p-value
Treatments	66.00	2	33.00		
Error	311.51	51	6.10	5.40	.007
Total	377.52	53			

The level of Significant 0.05

According to Table two, there was a significant difference in Reaction capabilities among district, state, and university-level male hockey players. Overall Significance indicates that the F(2,51) = 5. 40, p = 0. 007; p = 0. 007; Statistically significant differences exist between at least two groups. According to this, Variance Breakdown (66. 55%) indicates more between-group variation (61. 14), which explains the significant F-value.

Since the 'F ratio was higher, to see the difference between different teams representing district, state, and university level male hockey players of Bengaluru's reaction capability, the Tukey HSD Post-hoc report was calculated to determine the paired mean difference was used for all groups, and data related to those sports have been published in table three.

Table 3

Post-hoc analysis of the **multiple comparison** data on **Reaction ability** among district, state, and university-level male hockey players

Different level Group			Mean Diff.	Std. Error	Tukey HSD	L.con	U.con	Significance Difference
District level	State level	University level						
-	-1.73	-2.66	-4.39	0.82	0.09	-3.72	0.25	*
1.73	-	-0.93	0.80	0.82	0.50	-0.25	3.72	NS
2.66	0.93	-	1.73	0.82	0.06	0.67	4.65	*

The mean difference at the .05 level is significant, as shown by Table three. District level vs. University level Mean difference = -2. 67 (p = 0. 006) found significant. The mean at a university is noticeably higher than District One. It is clear from Table Three that participants are the most influential. Comparison of the district level to the state level: -1. 74 (p = 0. 098) found not significant. The difference between the state-level and university level hockey players is 0. 501 (p = 0. 501). The ANOVA confirms group differences (p = 0. 007), according to a significant overall effect (p = 0. 007). Only District level and University level hockey players differ greatly, according to specifics. The mean difference between district level and University level hockey players is not statistically significant, but not significantly different from either, likely due to higher variability. Hockey players on the other two teams are interwoven, but there is no such division, consistent with post-hoc findings.

Discussion:

In this analysis, we compared three groups of players (N=18 for each group) using descriptive statistics, ANOVA, and post-hoc tests to uncover differences in their mean scores. The results indicated that district-level players had the lowest mean score (6.65), followed by state-level players (8.39), with university-level players achieving the highest mean score (9.32). The variability of scores, as shown by the standard deviations, was moderate across all groups, with state-level players displaying the greatest variability. The 95% confidence intervals for the means indicated a significant separation between district and university-level players,

suggesting a noteworthy difference. This was confirmed by the ANOVA results, which showed a statistically significant overall difference among the groups ($F(2,51) = 5.40$, $p = 0.007$). The variance between groups was significantly greater than the variance within groups, supporting the existence of meaningful differences in group means.

Post-hoc pairwise comparisons clarified these differences. The only statistically significant difference was found between district-level and university-level players (mean difference = -2.67, $p = 0.006$). Comparisons between district and state-level players ($p = 0.098$) and between state and university-level players ($p = 0.501$) did not reach statistical significance. Subset analysis further confirmed that the mean score of state-level players was not significantly different from either district or university-level players, suggesting that state-level players occupy a middle ground.

Findings

In The ANOVA study, there are substantial group differences. Not all group means are equal. University-level hockey players outperforms District level hockey players: The only significant pairwise difference was between district level hockey players and University-level hockey players, with University level hockey players having a higher mean score. While state level hockey players mean is higher than District level hockey players and lower than University-level hockey players, these disparities are not statistically significant. Variability among state-level hockey players is the highest. The standard deviation was the highest in State level hockey players, which may have contributed to the lack of significant differences among the two groups.

Conclusion

The ANOVA results reveal significant differences in performance among the groups studied, indicating that not all group means are equal. Specifically, university-level hockey players demonstrated superior performance compared to district-level players, as evidenced by a statistically significant difference in their mean scores. Although state-level players showed a higher average score than district-level players and a lower average than university-level players, these differences were not statistically significant. The greater variability observed within the state-level group, reflected by the highest standard deviation, may explain the lack of significant differences between state and the other levels. Overall, these findings suggest that as players progress to higher competitive levels, particularly from district to university, their performance improves, while variability at the state level may indicate diverse skill development within that group.

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