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# Development of Discriminant Model for Handball Players Based on Team Cohesiveness

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**Abstract:** ***The primary purpose of the study was to determine the relative importance of different team cohesiveness parameters (Group-Task and Group-Social) in explaining the differences in performance levels between the high- and low-performing athletes, and the secondary purpose was to develop a real-valued pattern for clustering handball players into high- and low-caliber groups based on these parameters. Two hundred National level Indian handball players were selected for the study. The Group Environment Questionnaire (GEQ) were administered to each participant before the competition, and responses were recorded. Fifty samples were retained for the final analysis, with 25 handball players representing the top five teams and 25 participants coming from the bottom five teams. SPSS version 20.0 was used for the statistical analysis. The result showed that high-performance handball players had significantly higher mean values across all four group cohesion frameworks when compared to low-performance players. These included Group Integration-Task (GI-T), Group Integration-Social (GI-S), Individual Attraction via the Group-Task (IAG-T), and Individual Attraction towards the Group-Social (IAG-S) (IAG-S). A discriminant model was also developed to classify handball players into high- and low-achievement subgroups based on their levels of cohesion. To generate a discriminant function, the formula Z = -5.98 + 0.13 (GI-T), +0.12 (GIS), -0.04 (IAG-T), +0.14 (IAG-S) was developed. The discriminant model accurately classified 75% of the sample data points. Four components contributed to group cohesion, but the one with the most discriminatory power was the Individual Attraction to the Group-Social variable (IAG-S). If the discriminant function Z developed for the study yielded a positive value, the male handball players were placed in the poor performance group; if the value was negative, the players were placed in the high-performance group.***

**Keywords:** Handball, Team Cohesion, Discriminant Analysis

## 1. Introduction

The phenomenon of team cohesion refers to how well a team works together. Cohesion measures how close or far team members are from one another. There are two distinct cases; the first is that a successful team has excellent player cohesion or victory draws members closer together. In the second scenario, a close-knit squad of players leads to success. The term "direction of causation" describes these two distinct and unclear occurrences. A group is more likely to succeed when there is a high level of group cohesiveness. It is recognized as an important sociopsychological aspect influencing team sports performance. Carron defined cohesiveness as "a dynamic process manifested in a group's tendency to keep together and remain together in pursuit of its instrumental objectives and the fulfilment of member affective needs." (Carron A.V. and Brawley L.R., 1998). Cohesiveness refers to a team's ability to stay together throughout a game. Cohesion is task and social; the task dimension evaluates how well a team collaborates, and the social dimension evaluates how much team members enjoy each other. Many say that just because a team develops group cohesion does not guarantee that it will win a game until all cohesion characteristics are in place. Coaches may find it difficult to determine which characteristics are most significant for team cohesion.Williams and Widmeyer (1991) discovered that different coaching styles improve players' task or social cohesion. Also, social cohesion was not a crucial factor in establishing effective performance in elite rowing, implying that rowers do not have to like one another to perform well(Lenk H., 1969). Davids and Nutter discovered that players on successful volleyball teams were more cohesive around task elements than players on less successful teams. J. P. Verma (2012) identified four critical cohesion indicators and developed the GEQ (Group Environment Questionnaire) to assess them in team sports. Individual Attraction to Group Task (X1), Individual Attraction to Group-Social (X2), Group Integration-Task (X3), and Group Integration Social (X4) were the factors (X4) (Carron A.V. and Brawley L.R., 1998).

Handball is played with the goal of scoring goals (Kleinert J. et al., 2012). Rapid transitions between defense and offence are a hallmark of the game. Offensive players (6 court players + 1 goalkeeper) need to be able to move fast over short distances while making powerful direction changes (with and without the ball), fight off defenders in one-on-one situations, pass the ball, and use a wide variety of offensive techniques to score goals. In training and games, team handball relies on constant communication and interaction between players. Coaches are there to lead, direct, and give advice and criticism. Competitors could be there and might even make physical contact with one another. The rules of the game are subject to interpretation and application by referees, who may or may not be viewed favourably by spectators (Wagner et al., 2014).

Team leadership, team effectiveness, team roles, and group cohesiveness are just a few of the recently emphasized group characteristics contributing to team performance and success. Wagner et al. (2014)suggested two ways to illustrate group cohesion. Social Cohesion can be seen in a group's aspiration to forge strong friendships, whereas task cohesion refocuses members' attention on accomplishing

shared goals.Everyone in the group likely sees things from two different angles. How well-coordinated and cohesive the group is, and how appealing it is to be a part of the group (group attractiveness & group integration). There is a positive correlation between group cohesion and team performance, and the type of cohesion (social or task) makes no difference in this correlation. Since team success breeds cohesiveness, a strong sense of oneness may boost the chances of success. Studies have shown that female athletes' cohesion is more strongly linked to team performance than male competitors, indicating a gender gap in this area. Few studies have looked at how coaches might improve group cohesiveness, despite its obvious importance in team sports. In a study (Carron, 2002), cohesion suffers severely whenever a team reaches a size greater than six people. In a study (Martin, 2013),having a sense of community among teammates is a powerful psychological phenomenon that can boost performance. Gonzales (2013) stated that players aged 14-16 have the highest group cohesion.

Furthermore, new research suggests that encouraging a task-oriented, motivated environment might boost team cohesion and performance(Heuze, 2006). According to the task-orientation school of thought, coaches need to take the initiative by highlighting the importance of every team member and encouraging a collaborative, democratic approach to improving everyone's skills and team development.This research aimed to evaluate the task and social cohesion among higher and lower-performing male handball athletes to establish criteria for categorizing them using discriminant analysis based on group cohesion characteristics.

## 2. Material and Methods

a) Questionnaire employed to measure team cohesion.

| Group Environment Questionnaire (Carron et al. 1985) | | | |
|---|---|---|---|
| S. No. | Variables | Measurement | No. of Items |
| 1. | IAGT-T/X1 | This dimension measures team members' involvement in productivity, objectives, and goals. "I'm unhappy with my playing time" and "I don't like this team's style" are examples. | 04 |
| 2. | IAG-S/X2 | This dimension measures team members' personal participation, desires to fit in, and social interactions with the group, as evidenced by comments like "Some of my closest friends are on this team" and "I don't enjoy engaging in this team's social events." | 05 |
| 3. | GI-T/X3 | This dimension measures how closely each team member ties with their colleagues task-wise; for example, "We all assume responsibility for any loss or inadequate performance by our team." | 05 |
| 4. | GI-S/X4 | The way in which people evaluate the group as a whole is determined by this dimension. | 04 |

b) Design of the study

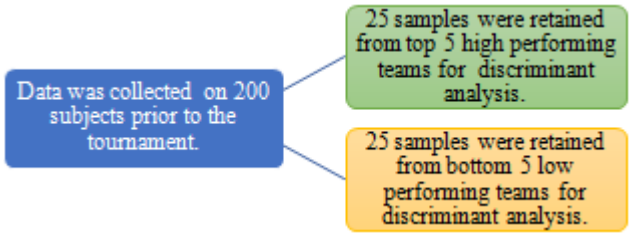


**Figure 1:** Design of the study

## 3. Results

**Table I:** Mean & Standard deviation being data about cohesive parameters of an elite handball sportsperson.

| Variables | High Performance | Low Performance | Mean Diff. |
|---|---|---|---|
| X3 | 18.21 ±3.30 | 15.0±4.81 | 3.19* |
| X4 | 23.17 ±5.00 | 16.83 ±5.38 | 6.34* |
| X1 | 23.21 ±5.48 | 21.96 ±5.00 | 1.25* |
| X2 | 20.13 ±5.18 | 16.00 ±3.1 | 4.13* |

*Significant at 0.05

Table I compares the mean values for the group cohesion indicators. When comparing groups with high and poor performance, significant mean differences of 3.19, 6.34, 1.25, and 4.13, respectively, were found for Group Integration-Task too, Individual Attraction to Group Integration-Social, and Group-Task, also Individual Attraction to Group-Social.The discriminant analysis results that were utilized to assess further the data are shown in Tables II through VI.

**Table II:** Un-standardized discriminant coefficients

| Variables | Function |
|---|---|
| X3 | 0.12 |
| X4 | 0.13 |
| X1 | -0.04 |
| X2 | 0.14 |
| (Constant) | -5.98 |

Table II displays the unstandardized discriminant coefficients. The discriminant function was developed using these coefficients. All four variables were included in the resultant discriminant model since it was determined that they all had a significant discriminant power. Considering these discriminant coefficients, the discriminant function that resulted was as follows:

$$Z = -5.98 + 0.12\,(X3) + 0.13\,(X4) - 0.04\,(X1) + 0.14\,(X2) \quad (1)$$

**Table III:** Wilk's Lambda distribution

| Equation of test | 1 |
|---|---|
| Wilk's lambda | 0.45 |
| $\chi^2$ | 23.00 |
| Degree of Freedom | 4 |
| Sig. | 0.00 |

Wilks' lambda distribution has a value of 0.45, as indicated in Table III, and as a result, the discriminant model is deemed adequate for creating a discriminant function. Wilks' lambda has a value between 0 and 1. The robustness of the model is shown by a lower Wilks' lambda value, while a greater value reflects the model's fragility. Table III's substantial chi-square value (p = 0.00) suggests that the discriminating criteria between the two groups are significant.

**Table IV:** Classification matrix

| Performance | | Predicted group membership | | |
|---|---|---|---|---|
| | | High Performance | Low Performance | Total |
| Original count | High | 20 | 5 | 25 |
| | Low | 8 | 17 | 25 |
| % | High | 80 | 20 | 100.0 |
| | Low | 20 | 80 | 100.0 |

Table IV shows how correctly and incorrectly both groups were categorized using the discriminant model. 75% of successfully categorized data shows this is a discriminant model of success. Table5 compares the discriminating power of the discriminant model's variable. A variable with a bigger coefficient may help differentiate the two groups. This variable has maximal discriminant power because IAG-S has a maximum coefficient of 0.64. IAG-T exhibited the lowest discriminant power (-0.28) of the four variables. This study aimed to classify male handball sportspersons into higher- and lower-performing groups. Using equation (1)'s discriminant function (Z), that may be done.

**Table V:** Standardized canonical discriminant function coefficients

| Variables | Function |
|---|---|
| X3 | 0.48 |
| X4 | 0.60 |
| X1 | -0.28 |
| X2 | 0.64 |

**TableVI:** Functions at group centroids

| Levels of performance | Function |
|---|---|
| Low | -0.814 |
| High | 0.814 |

The corrected means for Group 1 (poor handball players) and Group 2 (high handball players) are -0.814 and +0.814, respectively. 0 is the middle. Figure 1 shows how to create a straight line between two means by finding their midpoints. Figure 1 shows how to classify new subjects. Any male handball player is in the high-performance group if his discriminant score is Z > 0, but in the low-performance group, it is Z<0.

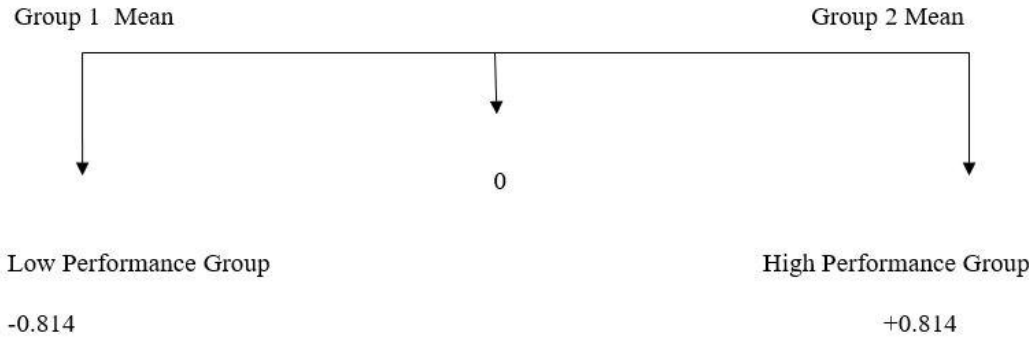


**Figure 2:** Group Centroids

## 4. Discussion

Male handball players with high and low-performance levels significantly differed in the four group cohesiveness metrics. The variable IAG-S exhibited the best discriminating ability among the four group cohesiveness factors.(Bird AM., 1977; JR, Ball et. al., 1977; Landers DM, 1971) Because the developed model successfully classified 75% of the samples, it is possible to consider it operational. According to the research's conclusions, teams who want to be successful in the competition should work together to achieve their goals. Researchers refer to this competency as togetherness (group integration) or teamwork (group cohesiveness). The most successful sports teams do not necessarily include the best players. Still, they have athletes who can collaborate effectively with their teammates to achieve a common goal, which contributes to the team's overall performance. It is universally understood that a group's cohesiveness contributes directly to that group's effectiveness. On the other hand, this assumption is predicated on feelings and perceptions that the facts may not support. The fact that you like competing against other people as part of a team does not always increase your chances of victory. The main goal of sport psychology research is to demonstrate that successful teams are cohesive.

## 5. Conclusion

That research submission is a compelling testimonial that team dynamics in sports impact players' self-confidence in their capacity to accomplish important objectives. These results suggest that sports psychologists and coaches benefit from evaluating team cohesion and creating team-building activities to enhance task cohesion. Coaches may take extra care to ensure that team members are aware of and satisfied with the shared commitment and the team's goals. They could also focus on encouraging cooperation, shared responsibility, or cultivating a "we" mentality.

### Conflict of Interest

The author declares no conflict of interest.

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