How Does Stance and Vision Affect Dart Throws?

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Abstract

Throwing darts is a common game amongst friends, family, and even strangers. For some people, throwing darts is more than just a game, it is a competition. The PDC, Professional Darts Competition, hosts tournaments throughout the entire world, all year round for professional dart throwers. There are many aspects that can affect your score on the dartboard, two being stance and vision. Which stance is the best? Is better to throw with your dominant foot forward or is it better to throw with your non-dominant foot forward? Then, comes the effect of vision. Should you focus on the dartboard with both eyes open, or only one eye open? If one eye, which one? This paper will examine the different throwing techniques and assess its impact on the average score of 3 dart throws. Overall, the the results did not produce significant evidence to suggest that foot stance or vision affects the accuracy of dart throws.

1. Introduction

Throwing darts can be quite the challenge for someone who has never tried before. Despite the game's popularity, many people have never attempted to throw a dart. For a first time thrower, stance and vision can dramatically affect whether or not the dart hits the board or completely misses altogether. Throwing a dart is not the same as throwing a football or throwing a baseball. In football and baseball, a player rotates his or her hips at release, but with darts, the thrower usually faces the target straight on with one foot forward and the other slightly behind. But which foot is it better to have forward: the dominant foot or the non-dominant foot?

A regulation dartboard is 18 inches in diameter and normally when throwing darts, the thrower stands 7 feet and 9.25 inches back from the board. From this distance, it is a challenge to hit the dartboard once, let alone on all 3 throws in a turn. Focusing on the dartboard from this distance puts a strain on the eyes. So, is it better to keep both eyes open, just the dominant eye, or just the non-dominant eye?

In addition to looking at stance and eyes individually, this paper examines which combination of foot stance and eyes open is the best. Although professional players already know what is comfortable for them, beginning and amateur players would probably be interested to know what the best technique is to get their throws closest to the center of the dartboard.

2. Materials and Methods

For the experiment, the effects of 2 different stances on dart throws were evaluated, the effects of vision on dart throws, and how the both of these together effect dart throws.

		Vision	
Stance	**Dominant Eye Open**	**Non-Dominant Eye Open**	**Both Eyes Open**
Dominant Food Forward	Dominant Foot Forward and Dominant Eye Open	Dominant Foot Forward and Non-Dominant Eye Open	Dominant Foot Forward and Both Eyes Open
Non-Dominant Foot Forward	Non-Dominant Foot Forward and Dominant Eye Open	Non-Dominant Foot Forward and Non-Dominant Eye Open	Non-Dominant Foot Forward and Both Eyes Open

5 male volunteers were used in the experiment with skills ranging from little to some dart throwing experience. Each participant completed each combination of dart throws. The order in which the volunteers threw the darts was randomized. Also, the order of which stance the participant took and which eye(s) were open was randomized, and the participants had no knowledge of the order. For each combination of stance and vision, a participant threw 3 darts. The average distance of these 3 throws from the center of the board was recorded in inches. The participants threw all darts from the same distance in the same room using the same darts, and the same experimenter measured the distance of the dart throws from the center of the board using a measuring tape. The participants' vision was manipulated by the use of an eye patch to cover the appropriate eye for each trial.

A 2 x 3 Factorial was used to analyze the effects of stance and vision on dart throws. The analysis was run using the software, JMP®, Version <*Macintosh*>. SAS Institute Inc., Cary, NC, 1989-2019.

3. Results and Discussion

As seen in Table 1, when the volunteers had their dominant foot forward, the mean distance of the darts from the center of the dartboard was 3.67 inches. When the throwers threw darts with their non-dominant foot forward, however, the mean distance of the darts from the center of the dartboard was 4.66 inches. We found that these means are not significantly different from each other ($F(1, 20) = 2.73$, p-value = .1139).

According to Table 1, when the volunteers had their dominant eye open, the mean distance of the darts from the center of the dartboard was 3.77 inches. For throwers throwing darts with their non-dominant eye open, the mean distance of the dart throws from the center of the dartboard was 4.17 inches. Lastly, on average, the mean distance of the darts from the center of the dartboard when the volunteers threw with both eyes open was 4.56 inches. These means were not significantly different from each other ($F(2, 20) = .57$, p-value = .57).

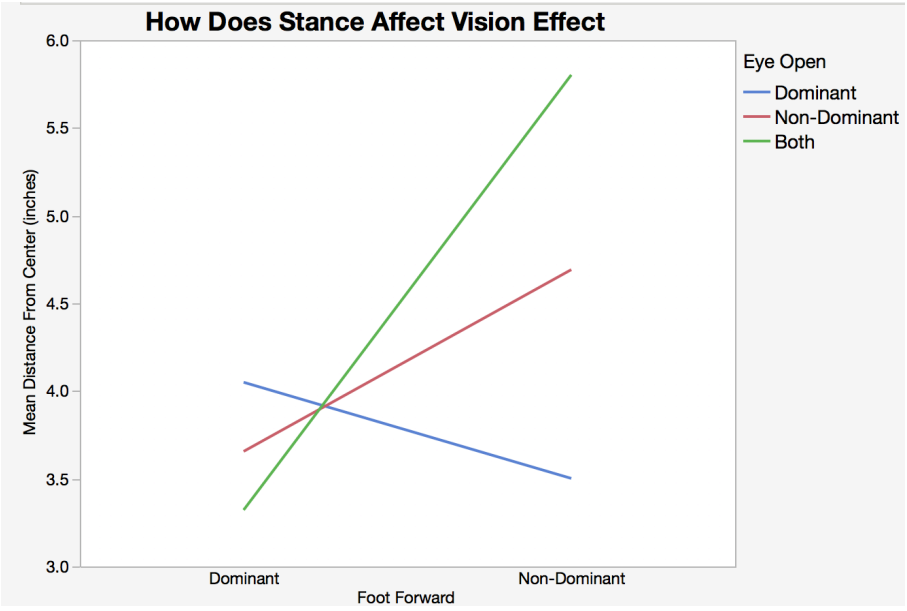
Table 1	**Mean Distance From Center**	**Mean Distance From Center**
Foot Forward	**Mean** (inches)	**Standard Deviation** (inches from person to person)
Dominant	3.67	1.28
Non-Dominant	4.66	2.09
Eye-Open	**Mean** (inches)	**Standard Deviation** (inches from person to person)
Dominant	3.77	1.63
Non-Dominant	4.17	1.05
Both	4.56	2.46

As seen in Table 2, the Non-Dominant Foot Forward and Both Eyes Open treatment had the greatest average mean distance of 3 darts from the center of the dartboard with 5.80 inches. The treatment with the smallest average mean distance of 3 darts from the center of the dartboard, 3.32 inches, was the Dominant Foot Forward and Both Eyes Open Treatment. This makes sense as professional dart throwers almost universally compete using the Dominant Foot Forward and Both Eyes Open technique. Nevertheless, in this study, the average mean distances of the 3 darts for the six treatment groups are not significantly different ($F(9,20) = 1.58$, p-value = .19).

Table 2		
Treatment	**Mean** (inches)	**Standard Deviation** (inches from person to person)
Dominant Foot Forward and Dominant Eye Open	4.05	1.63
Dominant Foot Forward and Non-Dominant Eye Open	3.65	0.92
Dominant Foot Forward and Both Eyes Open	3.32	0.89
Non-Dominant Foot Forward and Dominant Eye Open	3.50	1.40
Non-Dominant Foot Forward and Non-Dominant Eye Open	4.69	0.79
Non-Dominant Foot Forward and Both Eyes Open	5.80	2.66

Figure 1 shows that which foot the participant put forward did modify the expected average dart distance from center for each eye combination, and vice versa. However, the interaction effect between foot stance and eyes was not significant ($F(2,2) = 2.13$, $p = 0.14$).

Figure 1



4. Conclusion

Overall, it is possible that foot stance and which eye or eyes are kept open while playing darts does not affect how close the darts will be to the center of the dartboard. However, because only male and novice volunteers were used for the study, we do not know how stance and vision will affect females or more experienced players when throwing darts. Additionally, because the sample was not random, we can only conclude that there is no apparent advantage using the differing techniques of throwing darts to the 5 males used in the study. Despite the fact that we did not prove this treatment was significantly better than the others, we found that the dominant foot forward and both eyes open technique yielded the lowest mean distance of the 3 darts from the center of the dartboard. The results show the non-dominant foot forward and both eyes open technique had the greatest mean distance of the 3 distance of the 3 darts from the center of the dartboard, however we did not find this technique to be significantly worse than other techniques.

Due to the lack of significant results, it is possible that the best technique to throw darts is the method that feels most comfortable to the player and there is no universal best technique. Perhaps if this study was repeated with a larger sample size, there would be a significantly best or worst dart throwing technique.

5. Appendix

Figure 2

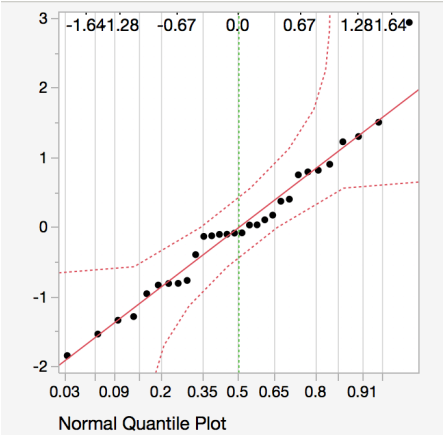
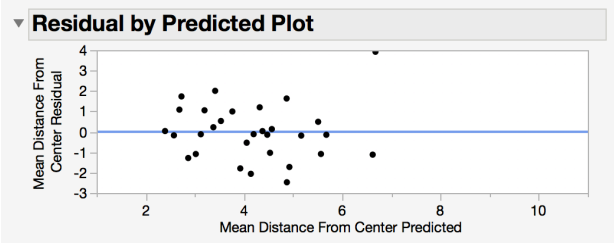


Figure 3



The condition for the assumption of normality of the residuals is met because as can be seen in the Normal Quantile Plot of the residuals in Figure 2, the residuals seem to neatly follow the line.

The condition for the assumption of equal variance of residuals seems to be met because the Residual by Predicted plot in Figure 3 does not seem to show any fanning pattern or deviation in variance based on the predicted mean distance from center for three dart throws.

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	9	38.207533	4.24528	1.5809
Error	20	53.708653	2.68543	Prob > F
C. Total	29	91.916187		0.1881

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Foot Forward	1	1	7.340853	2.7336	0.1139
Eye Open	2	2	3.089147	0.5752	0.5716
Person	4	4	16.308387	1.5182	0.2348
Foot Forward*Eye Open	2	2	11.469147	2.1354	0.1444

Foot Forward

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Dominant	3.6760000	0.42311800	3.67600
Non-Dominant	4.6653333	0.42311800	4.66533

Eye Open

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Dominant	3.7760000	0.51821160	3.77600
Non-Dominant	4.1740000	0.51821160	4.17400
Both	4.5620000	0.51821160	4.56200

Foot Forward*Eye Open

Least Squares Means Table

Level	Least Sq Mean	Std Error
Dominant,Dominant	4.0500000	0.73286188
Dominant,Non-Dominant	3.6560000	0.73286188
Dominant,Both	3.3220000	0.73286188
Non-Dominant,Dominant	3.5020000	0.73286188
Non-Dominant,Non-Dominant	4.6920000	0.73286188
Non-Dominant,Both	5.8020000	0.73286188

Person

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
1	4.9883333	0.66900830	4.98833
2	3.5333333	0.66900830	3.53333
3	5.0450000	0.66900830	5.04500
4	3.2416667	0.66900830	3.24167
5	4.0450000	0.66900830	4.04500