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Effects of Off-Hand Constraint on Potential Free-Throw Accuracy

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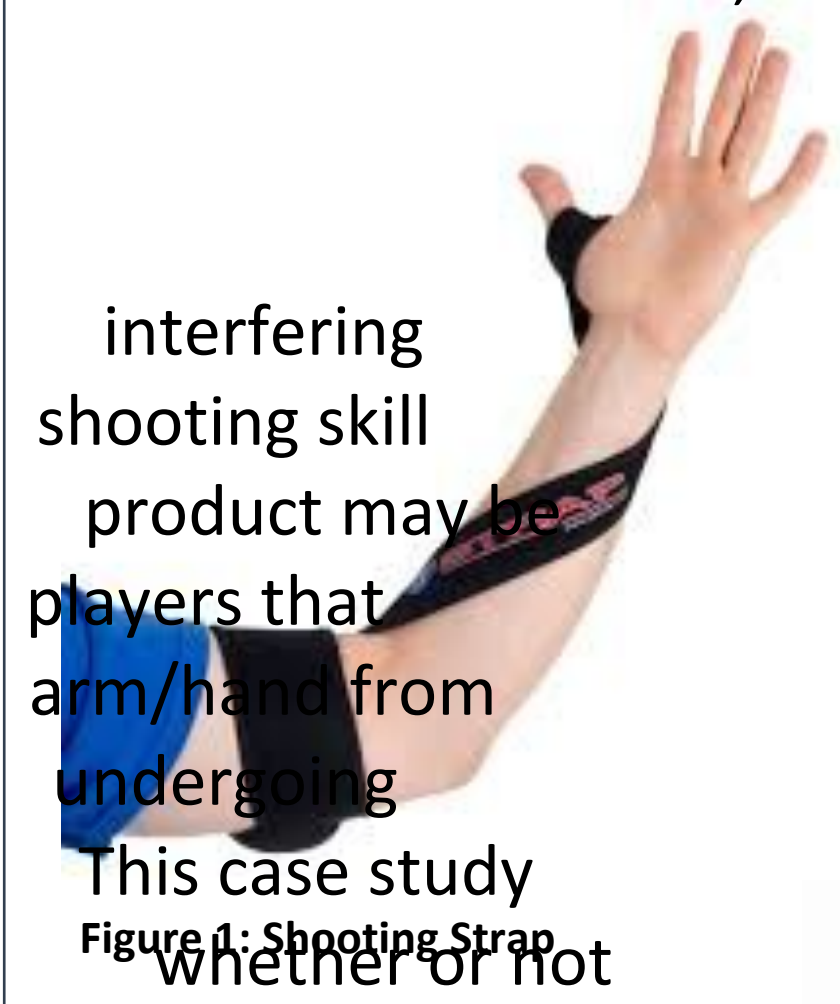
EFFECTS OF OFF-HAND CONSTRAINT ON POTENTIAL FREE-THROW ACCURACY



Colton Nelson, Nick Oelrich, & Alfred Johnson

Introduction

There are many different ways to perform shooting techniques in the sport of basketball. However, sometimes not using the correct technique will lead towards errors in precision and accuracy.



The shooting strap is a product designed to help prevent the guide arm from interfering with the shooting arm as the product undergoes its process. The product may be utilized as a tool for novice players that struggle keeping their guide arm/hand from pronating, interfering with the process of the shooting arm. This case study was designed to determine whether or not the shooting strap instantly

benefits athletes by significantly improving their technique, precision, and accuracy.

Participants

Age group/gender:

- There will be a total of 6 participants.
- All participants will be male.
- Age will be range between 15-23 years old.
- Skill level will range from novice to expert.
- They must have basic basketball knowledge, having played the sport prior to the study.

Methods

Before the trials began, a video camera was mounted 2 ft. above the top of the center of the backboard pointed toward the center of the rim. Once the camera was set, we began filming. The participants were informed that they were going to undergo three trials of shooting free-throws. For each trial, the participants were instructed to take 10 free-throw shots. No other instruction was given so that we could minimize the impact we had on the participants. After the first warm-up trial, one of the researchers would attach the shooting strap to ensure it was properly placed and tightened to maximize its effectiveness.

Trials

- First trial without the shooting strap (Warm-Up)
- Second trial using the shooting strap (With Strap)
- Third trial without the shooting strap (Without Strap)

Each free-throw taken was analyzed using Kinovea. The free-throws were evaluated for the amount of error and location from the center of the rim. The error was measured in centimeters from the center of the rim to the center of the ball as it passed through the plain of the rim. The location was measured in degrees with 0° pointing directly at the backboard from the center of the rim. The Kinovea data was gathered and entered into tables to determine the participant's precision and accuracy.

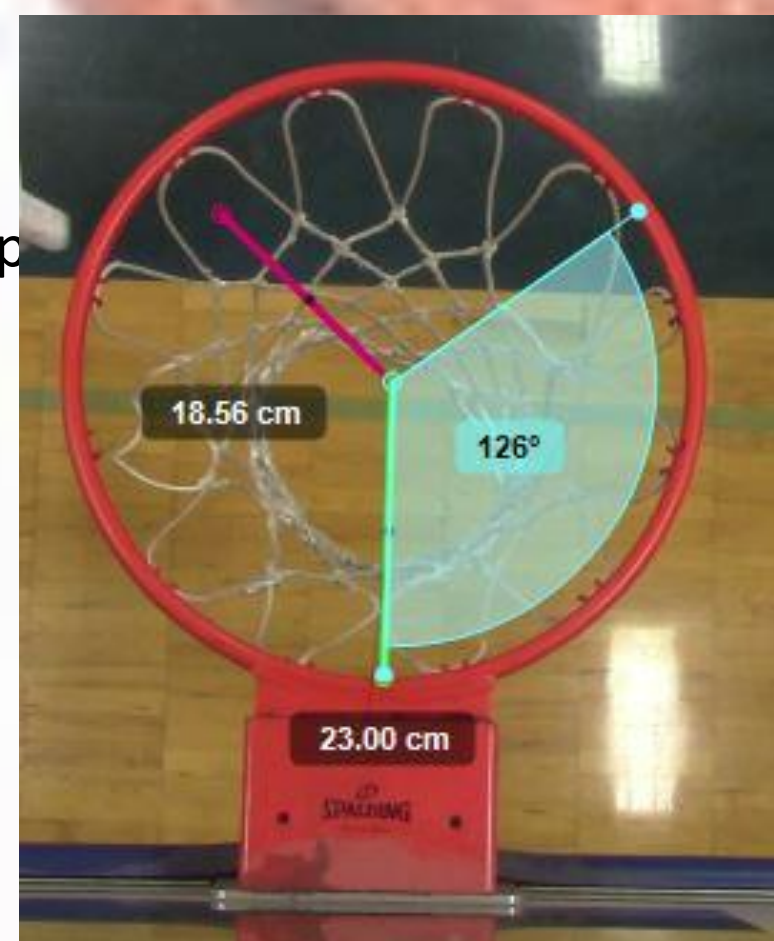
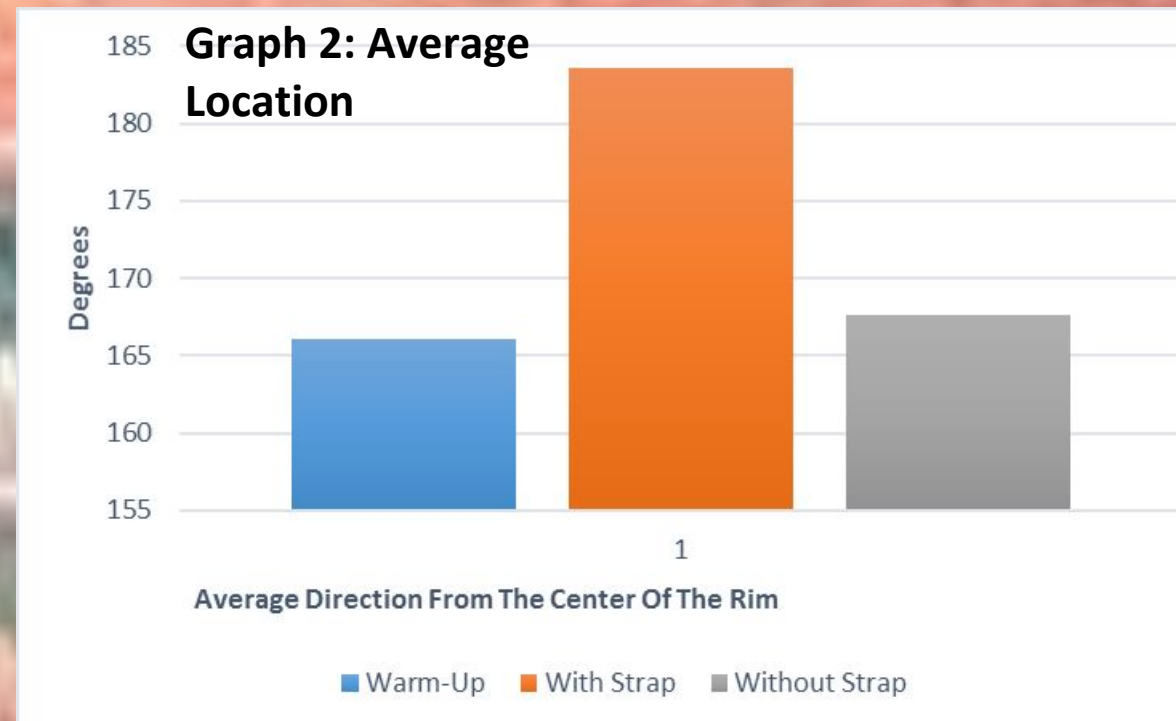
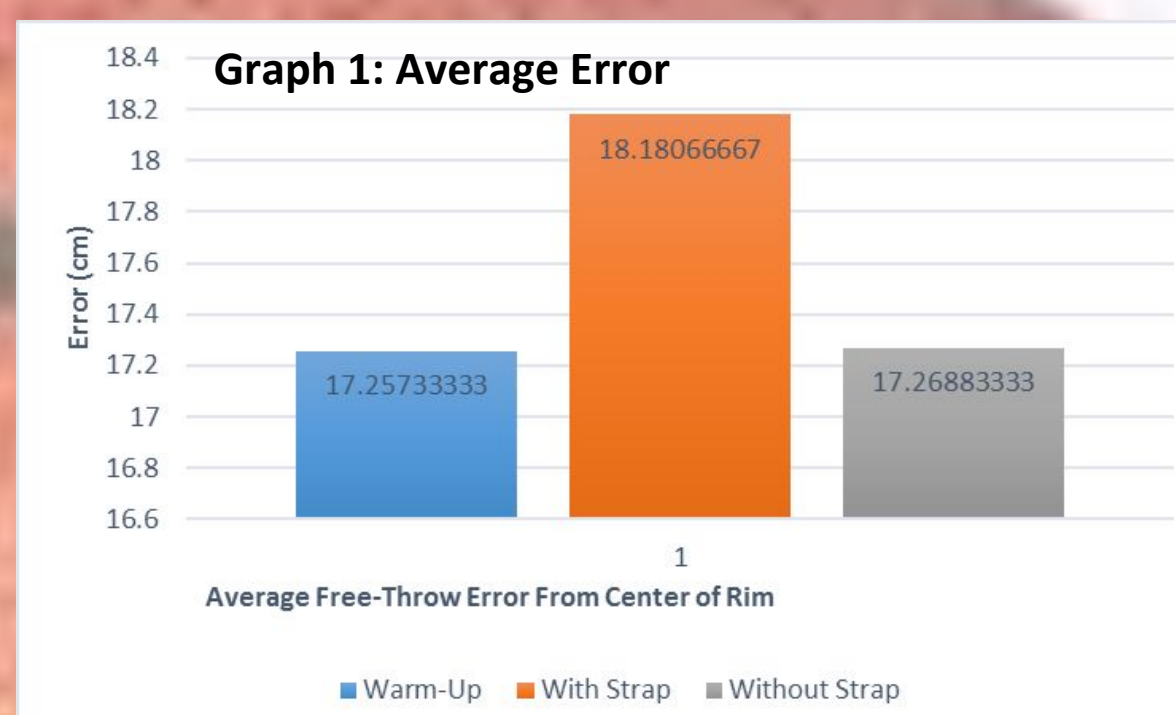


Figure 2: Kinovea Measurement Tools

Results

After completing the three trials for each participant, averages were taken to compare each trial's accuracy. Graph 1 shows that the average error for the Warm-Up trial was almost identical to the average error of the Without Strap trial. The With Strap trial average was higher than the two other trials without the strap.



The location averages shown in Graph 2, indicate both the Warm-Up and Without Strap trials display more deviation from the line between 0 and 180 degrees. This measurement is relevant and important to the accuracy of the shot as it shows the participant did not shoot the ball directly toward the center of the rim, but instead missed either left or right.



Figure 3: Warm-Up Average Location



Figure 4: With Strap Average Location



Figure 5: Without Strap Average Location

Conclusion

The data collected during this study showed that there was no immediate benefit gained in precision during short term use. While wearing the shooting strap, the participant's average error increased by nearly .7 cm. The shooting strap is advertised as it makes individuals better and increases the efficiency and effectiveness of their shot. As seen in the data, the strap actually made the participant's shots worse. Participants missed more free-throws and their average error was higher than both trials where the participant's off-hands were not constrained by the strap. The shooting strap did, however, increase the participants average accuracy by approximately 9°. This meant that while wearing the strap the participants had less deviation left or right from the center of the rim, but this improvement reverted back to the average once the strap was removed.

The shooting strap is not effective for short term use in increasing precision or accuracy, but more studies need to be completed to determine if it has long term effectiveness in these areas.

Trial Results

Participant #1:	Warm-Up	With Strap	Without Strap
Shot#	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
FG	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike
Error (cm)	19.81 22.1 17.01 12.45 15.58 11.55 29.3 16.02 12.2 11.65	28.47 19.25 16.3 26.27 15.94 16.43 13.35 16.12 28.32 15.44	15.95 11.95 15.99 19.65 11.28 11.01 10.81 10.54 22.77 8.1
Location	339 111 305 353 27 2 143 32 21 35	95 251 96 172 61 381 393 119 19 14	201 342 115 198 301 307 60 51 77 70
Average Error (cm)	14.15	14.64	17.51
Average Location	138.9	146.4	175.1
FG Total	6/10	2/10	6/10
Participant #2:	Warm-Up	With Strap	Without Strap
Shot#	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
FG	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike
Error (cm)	22.52 14.95 63.4 43.17 16.25 24.33 27.06 8.95 20.51 28.09	24.71 15.68 12.11 12.4 12.02 10.49 10.38 16.02 22.53 6.52	14.94 8.05 22.15 14.47 12.05 16.7 10 21.98 27.65 1.69
Location	104 88 64 51 153 112 161 334 312 159	74 151 63 138 88 37 153 138 165 90	37 15 391 35 31 183 22 111 163 180
Average Error (cm)	21.18	14.31	14.97
Average Location	150.8	108.8	112.4
FG Total	4/10	8/10	5/10
Participant #3:	Warm-Up	With Strap	Without Strap
Shot#	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
FG	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike
Error (cm)	9.43 6.3 7.38 25.1 15.11 18.35 13.1 10.12 34.63 14.55	11.85 17.32 9.58 9.18 11.61 8.18 4.52 9.64 24.6 24.24	12.57 25.02 12.11 24.07 25.02 3.13 29.25 34.08 11.22 10.3
Location	284 311 131 172 325 385 300 168 154 188	357 351 390 301 317 298 120 324 165 197	198 155 146 154 177 12 13 167 322 351
Average Error (cm)	15.42	11.24	18.78
Average Location	238.4	277.5	169.3
FG Total	7/10	9/10	8/10
Participant #4:	Warm-Up	With Strap	Without Strap
Shot#	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
FG	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike
Error (cm)	20.19 35.52 28.4 9.24 8.28 38.43 16.18 14.01 9.9 9.92	26.67 6.51 29.97 6.13 30.07 10.61 29.26 11.12 11.23 21.41	26.67 6.51 29.97 6.13 30.07 10.61 29.26 11.12 11.23 21.41
Location	185 185 198 323 43 178 23 147 92 394	227 254 194 153 162 35 185 43 348 155	227 254 194 153 162 35 185 43 348 155
Average Error (cm)	16.03	17.16	16.03
Average Location	171.6	173.7	171.6
FG Total	7/10	7/10	7/10
Participant #5:	Warm-Up	With Strap	Without Strap
Shot#	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
FG	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike
Error (cm)	32.84 12.51 14.97 10.05 25.95 35.55 12.85 9 9.12 8.39	12.49 8.18 10.58 16.16 11.54 11.42 3.5 12.93 22.95 16	12.49 8.18 10.58 16.16 11.54 11.42 3.5 12.93 22.95 16
Location	133 61 145 224 198 187 346 331 208 130	324 399 314 253 53 187 282 311 206 52	324 399 314 253 53 187 282 311 206 52
Average Error (cm)	17.09	14.85	14.85
Average Location	196.1	225.3	225.3
FG Total	7/10	6/10	6/10
Participant #6:	Warm-Up	With Strap	Without Strap
Shot#	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
FG	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike	Mike Mike Mike Mike Mike Mike Mike Mike Mike Mike
Error (cm)	34.55 11.05 11.87 15.85 29.73 21.4 27.45 9.4 11.43 28.34	37.49 27.41 35.46 11.88 32.07 49.64 9.38 10.54 17.25 27.98	10.53 21.23 17.54 19.5 11.24 19.33 6.25 33.31 21.3 23.2
Location	142 245 44 3 121 57 178 33 14 88	165 171 169 21 117 141 175 185 99 142	142 245 44 3 121 57 178 33 14 88
Average Error (cm)	19.71	25.98	18.35
Average Location	100.6	138.5	182.4
FG Total	5/10	4/10	6/10