A TEMPORAL ANALYSIS OF OVER-ARM AND SIDE-ARM THROWS IN CRICKET PLAYERS

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Introduction

Throwing is an essential element of cricket used for reducing runs and dismissing opposing batsmen (Freeston & Rooney, 2014), despite few studies have aimed to investigate the temporal aspects of throwing by identifying the duration of each phase within the throwing movement (Boroujerdi, Rahimi & Noori, 2009; Freeston, Ferdinands & Rooney, 2007). Throwing phases for an over-arm throw are depicted in figure 1, which include “wind up”, “stride”, “arm cocking”, “arm acceleration”, “arm deceleration” and “follow through” (Sachlikidis & Salter, 2007).

There is also a lack of research based upon different throwing techniques specifically for cricket. Freeston, Ferdinands and Rooney (2007) suggested over-arm throws to be the most common throwing technique compared to side and under-arms techniques, with little theoretical support. The only reliable piece of research comparing over-arm and side-arm throws specifically for cricket was conducted by Hussain and Bari (2002) who suggested that over-arm throws generated both greater endpoint velocity and accuracy.

The aim of the current study was to identify temporal, endpoint velocity and accuracy differences between over-arm and side-arm throwing techniques.

Methodology

Participants: Ten male, inexperienced amateur cricket players volunteered to participate in the current study (mean ± SD: age: 21.4 ± 2.2 years; height: 1.80 ± 0.04 m; weight: 83.4 ± 8.5 kg).

Procedures: Each participant was instructed to perform 10 throws (5 over-arm and 5 side-arm throws) utilising a counter-balanced study design to reduce the risk of fatigue on results. Each participant was instructed to throw the ball as “hard” and as “accurately” as possible towards a target set at 20.14 m, representing the distance of a cricket pitch, as used by (Freeston et al., 2007). The target consisted of 6 cricket stumps (71 cm x 0.35 cm) lined up in a row, with each stump equaling a different score value (0-5 points).

Data Analysis: The 2D analysis was conducted using a high speed camera (Casio EX-ZR2000), placed 7 m perpendicular to the line of the movement. All camera footage was analysed using SiliconCoach Live to retrieve temporal data of the movement phases.

A radar gun (Stalker ATS II) was positioned behind the cricket stumps (target) in line with the direction of the movement collecting 10 points).

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Descriptive statistics (means and standard deviations) were calculated for all variables. Comparative statistics were conducted in a customised MSExcel spreadsheet to calculate if any meaningful differences existed between over-arm and side-arm throws. Statistical significance which was set to a P-value < 0.05, percentage change scores and effect size statistic were calculated. Effect sizes can be interpreted as: Trivial (0.0 – 0.2); Small (0.2 – 0.6); Moderate (1.2 – 2.0); Large (2.0 – 4.0). The smallest worthwhile effect size difference was set to 0.2 to ensure small results may be observed (Puddie & Maulder, 2013).

Table 1: Over-arm and Side-arm throwing technique differences; including velocity, accuracy and temporal variables.

<table>
<thead>
<tr>
<th>Endpoint Velocity</th>
<th>Over-arm (Km/h)</th>
<th>±</th>
<th>SD</th>
<th>Side-arm (Km/h)</th>
<th>±</th>
<th>SD</th>
<th>P-value</th>
<th>Percentage Change</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy Per Throw</td>
<td>Points</td>
<td>0.6</td>
<td>±</td>
<td>0.4</td>
<td>0.5</td>
<td>0.7</td>
<td>0.774</td>
<td>0.97</td>
<td>0.09</td>
</tr>
<tr>
<td>Overall Accuracy Score</td>
<td>Points</td>
<td>3.1</td>
<td>±</td>
<td>2.0</td>
<td>2.7</td>
<td>3.6</td>
<td>0.774</td>
<td>-</td>
<td>0.07</td>
</tr>
<tr>
<td>Preparation Phase Duration</td>
<td>sec</td>
<td>0.56</td>
<td>±</td>
<td>0.18</td>
<td>0.50</td>
<td>0.12</td>
<td>0.180</td>
<td>10.9</td>
<td>0.39</td>
</tr>
<tr>
<td>Acceleration Phase Duration</td>
<td>sec</td>
<td>0.23</td>
<td>±</td>
<td>0.04</td>
<td>0.25</td>
<td>0.05</td>
<td>0.213</td>
<td>-4.5</td>
<td>-0.21</td>
</tr>
</tbody>
</table>

Practical Implications

The findings of the current study indicate over-arm throws compared to side-arm throws produce greater endpoint velocity and greater accuracy scores per throw in a cricket context. Throwing is a pivotal aspect of many different sports, such as baseball, water polo, javelin, handball and American football thus our findings should be considered by coaches and athletes when deciding what type of throw to utilise.

It is recommended that future research in this particular field acquire a greater sample size of participants with a greater level of experience to increase validity and reduce the risk of error.

Discussion

It was hypothesised that over-arm throws would produce greater acceleration phase time, thus resulting in a greater endpoint velocity, and leading to greater accuracy, based on the findings of Hussain and Bari (2002). These hypotheses were supported by the findings of the current study. Hussain and Bari (2002) suggested that there was not a distinct body segment that determined the differences in endpoint velocity, but rather the “integration of body segments”. This integration of body segments refers to sequencing of the movement also known as proximal to distal throw sequencing, has been described as the most important aspect of successfully performing over-arm throws (Cook & Strike, 2000). This aspect of sequencing also suggested potential reasoning as to why there were differences observed in accuracy per throw scores and overall accuracy scores.

Cook and Strike (2000) explains that this acceleration phase generates a stretch of the antagonist muscles within the shoulder, and in turn stores elastic energy. This storage of elastic energy, results in an enhancement of the concentric muscle contractions, the acceleration phase, as a result of the stretch reflex (Newton et al., 1997), known as the stretch shortening cycle (SSC). Consequently, one of the potential causes of over-arm throws generating a greater endpoint velocity could be attributed to a larger development of elastic energy during the cocking phase of over-arm throws, within the shoulder and upper extremity muscles.

References