Anecdotally, the fast pace at which the USA mens basketball team played at the 2008 Olympics was the main reason for their dominance, although there is no way of quantifying what a fast pace is or how it contributed to point differentials. The aim of this study was to examine the game-related statistics that discriminate between fast- and slow-paced games, as well as to identify key performance factors relating to point differentials. We analysed game-related statistics for each quarter of the eight games played by the USA using a k-means cluster analysis to classify game pace using ball possessions per game quarter. We then tested for differences in game statistics between slow- and fast-paced game quarters using analysis of variance and discriminant analysis. How differences in game-related statistics affected point differentials was examined using linear regression. The largest structure coefficient between game paces for the USA was for recovered balls (0.33, P < 0.001). The biggest contributors to the point differences in games were recovered balls (16.9, P < 0.001) and field goals (22.2, P < 0.001). We conclude that when the USA play a fast-paced game, they are able to recover more balls from opponents that they then turn into effective field-goal shooting.
Explanations for the United States of America's dominance in basketball in the Beijing Olympic Games (2008)

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Abstract

Anecdotally, the fast pace at which USA men’s basketball team played the 2008 Olympics was the major factor to their dominance, though there is no quantification of what a fast pace is, nor how it contributed to point differentials. The aim of this study was to identify the game-related statistics that discriminate between fast and slow paced games, as well as identify key performance factors relating to the point differential. We analyzed game-related statistics from each quarter for the eight games played by the USA using a k-means cluster analysis to classify game pace using ball possessions per game quarter. We then tested for differences in game statistics between slow and fast game quarters by ANOVA and discriminant analysis. How differences in game-related statistics affected the point differential were tested using linear regression. The largest structure coefficient between game paces for the USA was in recovered balls (0.33, \( P < 0.001 \)). The largest contribution to the point differences in the game were recovered balls (16.9, \( P < 0.001 \)) and field goals (22.2, \( P < 0.001 \)). We conclude that when the USA play a fast-pace game, they are able to recover more balls from opponents that they then turn into effective field-goal shooting.
Introduction

Preparing basketball teams to perform at the highest standard of competition is a complex process that is heavily dependent on the fitness and anthropometric characteristics of available players that are decisive to configure team strategy (Drinkwater, Pyne & McKenna, 2008). Traditionally, the National Basketball Association from the United States of America (NBA) and the United States of America (USA) national teams dominate international play. In recent years, with the increase of foreign players in the NBA it could be anticipated that differences between USA basketball and the rest of the world would decrease. However, at the 2008 Beijing Olympics the USA team won the gold medal with eight wins and a mean difference in points over opponents of 27.9±11.8 (range 11-49). It was suggested by basketball analysts that this success was based on a faster game pace leading to greater ball possession for the USA (Oliver, 2004). In fact, the USA team had 81.1±3.0 ball possessions per game against 70.7±2.1 from all tournament teams (Pelton, 2008). This faster game pace is probably supported by superior defensive assertiveness carried by highly conditioned players. The defensive performances are difficult to measure, because they can either have direct consequences (such as a steal or blocked shot) or, as is usually the case, indirect consequences (such as an opponent turnover or a low probability field-goal attempt) (Trninic & Dezman, 2005). Therefore, the sum of team ball steals and blocked shots (gaining possession) with the opponent-team turnovers provide a fair estimate from recovered balls of defensive
assertiveness. Defensive assertiveness is used to change game pace (Trninic, Dizdar & Dezman, 2000), that is, a team can accelerate a game by increasing defensive assertiveness. However, there is no evidence on how playing faster or slower affects game performance. Also, there are no studies that characterize elite-standard basketball performance.

Generally, basketball performance depends offensively on shooting field-goals and defensively on securing defensive rebounds (Ibanez, Sampaio, Saenz-Lopez, Gimenez & Janeira, 2003; Ittenbach & Esters, 1995; Karipidis, Fotinakis, Taxildaris & Fatouros, 2001). Specific contexts such as closely contested games, fouls and free-throws exhibit higher importance (Kozar, Vaughn, Lord, Whitfield & Dye, 1994). Other game-related statistics such as offensive rebounds, turnovers, steals or assists, are not reported consistently as discriminators between winning and losing teams. Conversely, when the criterion is not game outcome (winners against losers) but season-long success (best teams against worst teams) these results change. Ibanez et al. (2008) related basketball season-long success with best performances in assists, steals and blocks, denoting the importance from overall passing skills and better outside and inside defensive intensity. For instance, Krause & Pim, (1994) reported the importance of offensive performances to winning games and the importance of defensive performances to winning championships. This is probably attributable to greater stability in defensive performances (Oliver, 2004) because they are less influenced by environmental factors (such as game location). More recently, it has been suggested that the best
breakdown of offensive and defensive performances are obtained by analyzing four factors in the following order of importance: (1) effective field goal percentage, (2) offensive rebounding percentage, (3) turnovers per ball possession, and (4) free-throw rate (Kubatko, Oliver, Pelton & Rosenbaum, 2007; Oliver, 2004). Thus, the aim of this study was to identify the game-related statistics that discriminate between faster and slower paced games played by the USA team and their opponents. Additionally, we aimed to identify how the four performance factors are related with USA’s team game quarter outcome.

Methods

Sample and Procedures

Archival data were obtained from open-access official FIBA play-by-play records for the Beijing Olympics (2008). There were eight games played by the USA team against the following opponents: China (preliminary round, 31-point win), Angola (preliminary round, 21-point win), Greece (preliminary round, 23-point win), Spain (preliminary round, 37-point win), Germany (preliminary round, 49-point win), Australia (quarter-final, 31-point win), Argentina (semi-final, 20-point win) and Spain (final, 11-point win). The play-by-play game-related statistics were accumulated by game quarters (n=64) and included free-throw, two- and three-point field-goals (both missed and made), defensive and offensive rebounds, assists (pass that contributes directly to a field goal), committed fouls, blocked shots,
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steals and turnovers. Afterwards, recovered balls were determined by adding steals, blocked shots (that ended in gaining possession) and opponents’ turnovers. Team ball possessions and accumulated score differences at the beginning of each game quarter were also calculated and registered. Ball possessions were defined as the period of play between when one team gains control of the ball and when the other team gains control of the ball (Oliver, 2004) and were calculated using the equation: Ball possessions = (field-goals attempted) - (offensive rebounds) + (turnovers) - 0.4 x (free throws attempted).

According to the available literature (Kubatko et al., 2007; Oliver, 2004) effective field goal percentage was calculated from the equation: Effective Field Goal Percentage = (Field Goals Made + 0.5 x Three Point Field Goals Made) / Field Goals Attempted. Offensive rebounding percentage was calculated by the equation: Offensive Rebounding Percentage = Offensive Rebounds / (Offensive Rebounds + Opponents Defensive Rebounds). The recovered balls per ball possession were calculated by the equation: Recovered Balls per Ball Possession = (Steals + Blocked Shots + Opponents Turnovers) / Ball Possessions. Finally, the free throw rate was calculated by the equation: Free Throw Rate = Free Throws Made / Field Goal Attempted.

Differences between the confronting teams in these four performance factors were analysed. All data were gathered by FIBA (International Basketball Federation) professional technicians; however, two games were used to test data reliability (kappa coefficients). The results had
agreement coefficients of 1.0 for free-throws, two- and three-point field-goals (both missed and made), committed fouls, defensive and offensive rebounds, turnovers, steals and blocked shots. In the assists, the agreement coefficients were high (kappa=0.92).

Data Analysis

Stage 1. Game-related statistics that discriminate between faster- and slower-paced game quarters

A k-means cluster analysis was performed to identify a cut-off value of ball possessions and classify game quarters (Rost, 1995). The results identified cluster 1 (faster game quarters) with ball possessions of 20.9±0.9 (n=21, range 19.3-22.7) and cluster 2 (slower game quarters) with 17.0±1.3 (n=11, range 15.1-18.8) ball possessions.

One-way independent measures Anova was used to compare slower and faster game quarters and effect sizes were calculated to show the magnitude of the effects. Magnitudes of effect sizes are assessed using the following criteria: <0.20 = trivial, 0.20-0.59 = small, 0.60-1.19 = moderate, 1.20-2.0 = large, and >2.0 = very large (Hopkins, 2002). All game-related statistics were normalized to quarter ball possessions. Additionally, a descriptive discriminant analysis was performed to determine which of the obtained variables were more useful in predicting game pace. Discriminant analysis is robust for these derived rate variables.
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Interpretation of the obtained discriminant function was based on examination of the structure coefficients greater than |0.30|, meaning that variables with higher absolute values had a powerful contribution to discriminate between groups (Tabachnick & Fidell, 2007). Validation of discriminant models was conducted using the leave-one-out method of cross-validation (Norusis, 2004). Cross-validation analysis evaluated the usefulness of discriminant functions when classifying new data. This method involved generating the discriminant function on all but one of the participants (n-1) and then testing for group membership on that participant. The process was repeated for each participant (n times) and the percentage of correct classifications was taken as the mean for the n trials.

Stage 2. Relationship between performance factors and game-quarter outcome

Linear regression models explored effects of the independent variables on game quarter outcome (difference between points scored and allowed) in the whole game, in the first half game quarters and in the second half game quarters. When estimating both models, heteroscedasticity in residuals and multicollinearity among regressors did not occur. Moreover, the RESET test by Ramsey (1969) did not reveal specification problems. When interpreting the statistical results, positive or negative coefficients indicate a greater or lower propensity to increase/decrease game quarter
outcome, respectively. Four independent variables were included in the model: Effective Field Goal Percentage, Offensive Rebounding Percentage, Recovered Balls per Ball Possession, and Free Throw Rate. The model is as follows: 

$$QO = \beta_1 + \beta_2 \cdot FG + \beta_3 \cdot OR + \beta_4 \cdot RB + \beta_5 \cdot FT + \varepsilon_i$$

Key: $QO =$ game quarter outcome, $FG =$ Effective Field Goal Percentage, $OR =$ Offensive Rebounding Percentage, $RB =$ Recovered Balls per Ball Possession, $FT =$ Free Throw Rate.

Differences in accumulated score differences at the beginning of each quarter and in game quarter outcome were tested with non-parametric Wilcoxon matched pairs test.

Statistical analyses were performed using SPSS software release 16.0 (SPSS Inc. Chicago, Illinois, USA) and STATA for Windows version 10.0 (Stata Corp. LP. Texas, USA). Statistical significance was set at $P < 0.05$.

Results

Stage 1. Game-related statistics that discriminate between faster and slower paced game quarters

Table 1 presents the accumulated game-related statistics normalized to ball possessions, obtained in faster- and slower-paced game quarters for the USA team and their Opponents. For the USA team, there were differences in 2-point field goals made (ES=-0.90), free-throws missed (ES=-0.88) and recovered balls (ES=-1.28), with higher values in faster
games ($P = \text{at least } 0.02$). Differences in the Opponents occurred only in committed fouls ($P < 0.001 \ ES=-0.86$). In the discriminant analysis, a $\chi^2=34.5$ was obtained for the USA team games ($P < 0.001$) allowing to identify a smaller subset of game statistics that enable to discriminate between fast and slow paced games. For the Opponents games, it was not the case ($\chi^2=19.0$, $P = 0.06$). The structure coefficients quantify the potential of each game-related statistic to maximize differences between means amongst slower and faster paced game quarters. The larger the magnitude of the coefficients, the greater the contribution of that game-related statistic to the discriminant function. For the USA team, the discriminant function reflected an emphasis on recovered balls (structure coefficient=0.33 see Table 1).

***Table 1 near here***

The leave-one-out test summarizes the ability of the discriminant functions to classify correctly game quarters in their respective groups (slower of faster). This analysis provided an overall percentage of successful classification of 93.8% for the USA team.

**Stage 2. Relationship between performance factors and game-quarter outcome**

Effects of the independent variables on game quarter outcome are displayed in Table 2. In the whole match model (Model 1) this outcome
was explained by the four factors. However, their order of importance was changed and recovered balls appeared as the second most important factor in explaining differences in game-quarter scores. For each recovered-ball-per-possession more than the opponent, the USA team increased game-quarter outcome by 16.9±5.1 points (see Table 2). The intercept was not statistically significant. The linear regression model explained about 71% of the variance in game quarter outcome.

***Table 2 near here***

Game quarter outcome in the first-half game quarters (Model 2, Table 2) was explained by the four independent variables included in the model. The importance of each recovered-ball-per-possession more than the opponent, increased game-quarter outcome to 18.5±6.3 points ($P < 0.001$). The coefficient of determination was 0.87.

Finally, game-quarter outcome in the second-half game quarters (Model 3, Table 2) was explained only by superiority in field-goal percentages. The coefficient of determination was 0.43.

From the first-half game quarters to the second-half equivalents, the accumulated-score differences differed at the beginning of each quarter (7.3±8.8 vs. 25.5±10.3, $P < 0.001$) but not in game quarter final outcome (8.5±5.7 vs. 7.4±5.1, $P = 0.09$).

Discussion
The aim of this study was to identify game-related statistics that discriminated between faster- and slower-paced games played by the USA team and their opponents. Also, we aimed to identify how the advantages in the four performance factors were related to USA team's game-quarter outcome. Our findings indicate that an increase in game pace has resulted in more recovered balls and higher number of successful two-point field goals, while not hindering their performance to a substantial degree in any of the other game-related statistics. Conversely, when the opposition increased the game-pace they increased only the number of fouls they committed. Our results also show that while this high rate of defensive pressure was important in asserting dominance in the first half of the game and to the overall result of the game, its contribution was diminished in the second half.

Stage 1 analysis indicated the importance of recovered balls (our indirect measure of defensive pressure) to increase game pace and win. High-pressure defence is important because it leads to more turnovers from the opposition and thus more scoring opportunities for the team capable of maintaining a fast-paced game. In fact, this style of play requires complementary participation between team players. For example, guards' ability to steal the ball and centres' ability to block field goals (Dezman, Trninic & Dizdar, 2001; Sampaio, Janeira, Ibanez & Lorenzo, 2006). This is also the result of effective team defensive communication that leads to increased defensive pressure in all passing spots and ultimately, to bad passes, passes that are easier to steal or inadequate use of dribbling
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(Gomez, Tsamourtzis & Lorenzo, 2006; Otto, 1998). Since we do not have any measures of fitness of the Olympic players, the suggested importance of fitness to assertive defence is speculative, but there is no doubt that high-pressure defence strategies such as the full-court press and challenging the opposition when they pass or shoot require much greater expenditure of energy. High fitness would allow players to maintain high-pressure defence for a greater proportion of the game. Sport-specific fatigue impairs technical components of a sport (Gabbett, 2008; Royal et al., 2006), so for teams who are less fit, switching to more assertive defensive techniques could simply result in them committing more fouls.

Stage 2 analysis assesses the contribution of four performance factors to the point differential. Results of the Stage 2 (model 1) analysis indicate that recovered balls are second in importance in their contribution to overall point differential of the game only to field goal percentage. While the importance of field-goal percentage to winning is intuitive and consensual (Gomez et al., 2008; Sampaio & Janeira, 2003), the relationship between field goals and recovered balls highlights the importance of scoring points when a turnover results to the overall outcome of the game. That measures of assertive play on both offence (offensive rebounding) and defensive (recovered balls) play are factors in the first half but not in the second (model 2) indicate that the USA’s assertive play diminished in the second half. If this is the result of fatigue from the first half’s high expenditure of energy or that once the team has asserted dominance in the first half (led by 25.5±10.3 points) there is a
strategic decision made to play more conservatively to finish the game (led by 27.9±11.8 points) we cannot say. However, because the games’ schedule is concentrated, the importance of adequate recovery is enhanced. Therefore, it would be more likely that winning by large margins cause much less intense play overall.

Conclusions

Our results indicate the value of assertive play on both offence and defence to the overall outcome of a basketball game. Recovery of balls from the opposition, our indicator of defensive pressure, played a particularly important role, and it was this attribute at which the USA excelled when they increased the pace of the game. The intuitive high energy expenditure of high-pressure offence and particularly defence means that teams hoping to execute this strategy effectively will need high fitness.
References


Table 1 - Descriptive results (quarter accumulated frequencies by ball possessions), effect sizes (ES) and discriminant function structure coefficients (SC) from game-related statistics for slower and faster games (mean ± s).

<table>
<thead>
<tr>
<th>Game-related statistic</th>
<th>Slow-paced</th>
<th>Fast-paced</th>
<th>ES</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 point field goals missed</td>
<td>3.45±2.16</td>
<td>3.52±1.75</td>
<td>-0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>2 point field goals made</td>
<td>6.09±2.12</td>
<td>8.00±2.10</td>
<td>-0.90</td>
<td>0.25</td>
</tr>
<tr>
<td>3 point field goals missed</td>
<td>3.73±1.95</td>
<td>4.00±1.45</td>
<td>-0.16</td>
<td>0.05</td>
</tr>
<tr>
<td>3 point field goals made</td>
<td>2.18±1.78</td>
<td>2.52±1.33</td>
<td>-0.22</td>
<td>0.06</td>
</tr>
<tr>
<td>Free-throw missed</td>
<td>1.27±1.49</td>
<td>2.62±1.56</td>
<td>-0.88</td>
<td>0.24</td>
</tr>
<tr>
<td>Free-throw made</td>
<td>4.00±2.45</td>
<td>4.90±2.39</td>
<td>-0.37</td>
<td>0.10</td>
</tr>
<tr>
<td>Recovered balls a, b</td>
<td>2.64±1.43</td>
<td>5.24±2.47</td>
<td>-1.28</td>
<td>0.33</td>
</tr>
<tr>
<td>Assists</td>
<td>4.91±2.12</td>
<td>4.52±1.97</td>
<td>0.19</td>
<td>-0.05</td>
</tr>
<tr>
<td>Offensive rebounds</td>
<td>2.73±2.00</td>
<td>3.14±2.08</td>
<td>-0.20</td>
<td>0.06</td>
</tr>
<tr>
<td>Defensive Rebounds</td>
<td>7.36±1.91</td>
<td>7.48±2.20</td>
<td>-0.06</td>
<td>0.01</td>
</tr>
<tr>
<td>Committed Fouls</td>
<td>4.82±2.48</td>
<td>6.24±2.02</td>
<td>-0.62</td>
<td>0.18</td>
</tr>
</tbody>
</table>

| Opponents                       |            |            |      |      |
| 2 point field goals missed      | 5.82±1.72  | 4.71±1.82  | 0.62 | -    |
| 2 point field goals made        | 5.36±1.96  | 4.95±2.20  | 0.20 | -    |
| 3 point field goals missed      | 3.73±1.10  | 4.86±2.26  | -0.63| -    |
| 3 point field goals made        | 1.64±1.21  | 1.95±1.28  | -0.25| -    |
| Free-throw missed               | 0.91±1.22  | 1.29±1.19  | -0.31| -    |
| Free-throw made                 | 3.73±3.13  | 3.90±2.45  | -0.06| -    |
| Recovered balls                 | 2.27±1.49  | 3.10±1.48  | -0.56| -    |
| Assists                         | 2.45±1.04  | 2.67±1.74  | -0.15| -    |
| Offensive rebounds              | 4.09±1.45  | 3.00±1.79  | 0.66 | -    |
| Defensive Rebounds              | 5.64±1.50  | 5.57±1.47  | 0.05 | -    |
| Committed Fouls a               | 4.73±1.68  | 6.81±2.96  | -0.86| -    |

a) Discriminant structure coefficient above |0.30|.
b) Univariate differences between slow and faster paced game quarters (P < 0.05).
Table 2. The influence of the four performance factors on USA’s game quarter outcome. Results from the three regression models (S.E.).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Whole Game</th>
<th>First Half Game Quarters</th>
<th>Second Half Game Quarters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.2</td>
<td>1.2</td>
<td>3.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(0.9)</td>
<td>(1.0)</td>
<td>(1.5)</td>
</tr>
<tr>
<td>Effective field goal percentage</td>
<td>22.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>26.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.3&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(3.7)</td>
<td>(4.3)</td>
<td>(6.5)</td>
</tr>
<tr>
<td>Offensive rebounding percentage</td>
<td>12.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>(3.0)</td>
<td>(3.3)</td>
<td>(5.4)</td>
</tr>
<tr>
<td>Recovered balls per possession</td>
<td>16.9&lt;sup&gt;b&lt;/sup&gt;</td>
<td>18.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>14.4</td>
</tr>
<tr>
<td></td>
<td>(5.1)</td>
<td>(6.3)</td>
<td>(9.5)</td>
</tr>
<tr>
<td>Free-throw rate</td>
<td>6.3&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>(3.6)</td>
<td>(5.0)</td>
<td>(5.3)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>31</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.71</td>
<td>0.87</td>
<td>0.43</td>
</tr>
</tbody>
</table>

<sup>a</sup> $P < 0.05$

<sup>b</sup> $P < 0.01$