The Comparison of Attacking Aspects between the International Level and Domestic Level in Amputee Soccer Tournament

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Aim: The purpose of this study was to clarify attacking aspects focused on the initiation of attacks in amputee soccer comparing with different competitive level. Methods: Data were collected from 5 matches played in the 2014 World Cup in Mexico, and 6 matches played in the 2015 championship competition in Japan. Match-performance analysis was used to quantify variables about starting zone of attack, number of successive passes and attacking type. Results: All variables were significant differences between the international level and the domestic level. Attacking middle zone (AMZ) in the starting zone of attack was the highest value in both levels ($\chi^2 = 128.8$, df $= 5$, $p < 0.01$). There were significant differences in the rate of AMZ and Defending zone (DZ) between the levels ($p < 0.01$). The number of successive passes in each starting zone of attack were significantly differences in Defending middle zone (DMZ), DZ and Defending penalty zone (DPZ) ($p < 0.01$). Kick-in (KI) of attacking type was the highest value at 27.2% in international level, whereas stealing the ball (SB) was the highest value at 27.5% in domestic level ($\chi^2 = 144.8$, df $= 7$, $p < 0.01$). Conclusions: This study showed that the attacking aspects were differences depending on the competition level in amputee soccer. And, it was suggested that need to familiarize the possession play in order to improve the domestic level in Japan. Moreover, this study found importance of the re-start play in particular KI for the high competitive level.

Keywords: coaching, descriptive analysis, attacking strategies

1. Introduction

Amputee soccer is one of kinds of soccer designed for the physically challenged, those who have undergone amputations as well as those with extremity dysfunction. Don Bennett began modern amputee soccer in Seattle, United States, in 1980 (Frere, 2007). World Amputee Football Federation (WAFF) standardized the rules of the match. As a result, amputee soccer has gained popularity in the disability community all over the world, and the number of athletes increased. On the other hands, there is scant scientific evidence on the amputee soccer compared to other soccer. Several studies have examined the physical characteristics of amputee soccer players (Özkan et al., 2012; Simim et al., 2013; Wieczorek et al., 2015). However, match-performance analysis has not been carried out on amputee soccer.

Match-performance analysis is widely used as a method for studying player and team performance in a soccer match (Tenga et al., 2010a). And, their notation is basically aimed at analysis of movement, tactical evaluation, technical evaluation and statistical compilation (Hughes, 2003). Performance indicators defined aspects of performance and can be associated with offensive attacking and defensive tactics in soccer (Hughes and Bartlett, 2002). Leite (2013) analyzed the goal scoring patterns by means of descriptive and comparative analyses of unidimensional frequency data (e.g., number of shots, number of assists, and number of shots against).
These authors found that performance indicators in
offensive phase were important for successful per-
formance in the tournament.

Attacking aspects of play have previously been
deﬁned as direct, possession, counterattacking,
total soccer and crossing (Fernandez-Navarro et al.,
2016). In particular, “direct” and “possession” of
play are the most commonly described attacking
styles (Hughes and Franks, 2005; Redwood-Brown,
2008; Ruiz-Ruiz et al., 2013; Tenga et al., 2010a;
Tenga et al., 2010b; Tenga and Larsen, 2003).
“Direct play” is characterized by longer passes, low
number of passes, short passing sequences and a
low number of touches per ball involvement in con-
trast to “possession play” (Fernandez-Navarro et
al., 2016). Reep and Benjamin (1968) showed two
major ﬁndings. One was nearly 80% of goals were
scored after three or fewer successive passes. Sec-
ondly, one goal was scored for every 10 shots. More
recently, Hughes and Franks (2005) standardized
the counting of successive passes and re-examined
the correlation between shots and goals. Their
results showed that successful teams attempted
shots after more number of successive passes, and
that the percentage of goals in relation to shots was
higher in possession play than in direct play. In
fact, a number of teams in the present day rely on
possession play, which involves more ball contact
than direct play. Studies on possession play are
often evaluated such as the number of successive
passes and the starting zone of attacks on pitch
(Garganta 2009; Gómez et al., 2015; Mahony et al.,
2012; Sgro et al., 2015).

It is necessary to study similar approach in order
to improve the knowledge of the attacking aspects
in amputee soccer. Especially, the attacking aspects
will expect to be affected by competition rules
adapted to disabilities. In particular, there are
differences from soccer that amputee soccer have no
application of offside and do kick-in instead of
throw-in. Moreover, Fernandez-Navarro et al.
(2016) reported that the utilization of attacking
aspects could depend on team formation (number
of players per zone), player defensive abilities
and/or the opponent’s attacking abilities. The initi-
atation of attacks will be an important aspect in
offense and defense, because it is also includes ball
taken from the opponent. Therefore, the purpose
of this study was to clarify attacking aspects focused
on the initiation of attacks in amputee soccer com-
paring with different competitive level. In this
study, data collected in matches of international
level and Japanese domestic level, and was com-
pared between levels. Japan national team have par-
ticipated in the world cup three times, but have not
became higher rank in any competition. Tenga et al.
(2010a) indicated the match-performance analysis
could make coaching interventions more objective
and decisive as well as enhance match performance.
In the light of these opinions, the data obtained in
this study would provide useful information to
training plans for enhance match performance.

2. Materials and methods

2.1. Materials

Data were collected from 5 matches played in the
2014 World Cup in Mexico (international level),
and 6 matches played in the 2015 championship
competition in Japan (domestic level). All matches
were applied international 7 versus 7 rules. The
match is performed in competition of two teams,
each consisting of not more than 7 players one of
whom is the goalkeeper. Matches were played pitch
measuring 60 m length × 40 m width, and duration
of a match is two equal periods of 25 minutes each
(interval 10 minutes). The video footages of the
match were collected using 2 video cameras (Sony
HDR-CX420, Tokyo, Japan; Sony HDR-PJ390,
Tokyo, Japan) to record the match and individual
movements of all players. One stationary camera
was placed at high in the stands on the half-way
line. The other camera was placed behind the goal-
line to record sideward movements. The validity of
collecting data by video camera was reported previ-
ously (Scarfone et al., 2015). The Ethics Committee
of the University of juntendo approved this study.

2.2. Match-performance analysis

It was shown in Figure 1 that outline of match-
performance analysis of amputee soccer in this
study.

2.2.1. Description of shots

A goal is normally preceded by a shot. This study
deﬁned shots as the kicking a ball for opponent
goals to score. Any time a player makes an attempt
(regardless of results) to take a shot and the ball
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2.2.2. Description of passes

Passes start when a player gains possession of the ball by any means other than from a player of the same team. The player must have enough control over the ball to be able to have a deliberate influence on its subsequent direction. A possession was a series of passes between players of the same team, but to end immediately when one of the following events occurs; a) the ball goes out of play; b) the ball touches a player of the opposing team (e.g., by means of a tackle, an intercepted pass). A momentary touch that does not significantly change the direction of the ball is excluded as c) an infringement of the rules takes place (e.g., a player is offside or a foul is committed) (Pollard and Reep, 1997).

2.2.3. Classification of zone

The amputee soccer pitch was divided into 6 zones in this study; Attacking penalty zone (APZ), Attacking zone (AZ), Attacking middle zone (AMZ), Defending middle zone (DMZ), Defending zone (DZ), and Defending penalty zone (DPZ). Classification of zone was shown in Figure 2. This study was divided into 4 zones according to Nakayama et al. (2015), then it was added on both sides penalty area as a zone. The reason for modification was in consideration of the specific rules of amputee soccer. The goalkeeper in amputee soccer is not allowed to leave the penalty area during match play (Yazıcıoğlu, 2007). Therefore, this study classified the penalty area as the zone, unlike the regular soccer. All games collected data were carried out at a pitch of 60 m × 40 m (World Amputee Football Rules 7 vs 7). Thus, all games were analyzed in the 6 zones.

2.2.4. Classification of attacking type

The attacking type following 8 variables were used in this study: Free kicks (FK), Corner kick (CK), Penalty kick (PK), Kick-in (KI), Goal Kick (GK), Stealing the ball (SB), Losing the ball (LB) and Goalkeeper’s pass (GP). In addition, this study divided into two as the Re-start of play for FK, CK, PK, KI, GK, and the Ball in play for SB, LB, and GP. Descriptions and definitions were shown in Table 1.

2.3. Video analysis

The video footages were used for software program Final Cut Pro® (Apple version 9.0, San Francisco, United States) and then converted from Mac format to WMV PC format to allow further analysis using Windows Media Player. While the events related to the performance indicators were recorded in an electronic spreadsheet. Two skilled analysts with more than five years of expertise in the national analysis approach observed each match twice with approximately one month between the two
Figure 2. The pitch marking to determine field zones (adapted from Nakayama et al., 2015). APZ; Attacking penalty zone, AZ; Attacking zone, AMZ; Attacking middle zone, DMZ; Defending middle zone, DZ; Defending zone, and DPZ; Defending penalty zone.

Table 1. Descriptions and definitions of attacking type used in the match-performance analysis.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-start of play</td>
<td></td>
</tr>
<tr>
<td>FK; Free kicks</td>
<td>Re-started after receiving a foul from opponents. There are two kinds of direct and indirect.</td>
</tr>
<tr>
<td>CK; Corner kick</td>
<td>Re-started after the opponent’s ball crossed the goal line of offensive side. CK allow to score directly.</td>
</tr>
<tr>
<td>PK; Penalty kick</td>
<td>Re-started after receiving a foul from opponents in the penalty area. PK allow to score directly.</td>
</tr>
<tr>
<td>KI; Kick-in</td>
<td>Re-started after the opponent’s ball crossed the touch-line. KI is not allowed to score directly.</td>
</tr>
<tr>
<td>GK; Goal Kick</td>
<td>Re-started after the opponent’s ball crossed the goal line of defensive side. However, GK must not cross the half-way line directly without touching other players and the ground.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ball in play</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB; Stealing the ball</td>
<td>Steeled the ball away from opponents. (e.g., one-on-one, intercept of pass; to block or cut a pass between opponents)</td>
</tr>
<tr>
<td>LB; Loosing the ball</td>
<td>No possession of either team by Clearance Ball.</td>
</tr>
<tr>
<td>GP; Goalkeeper’s pass</td>
<td>Started by goalkeeper throw or punt kick.</td>
</tr>
</tbody>
</table>

2.4. Reliability test

The reliability of the data collected was subjected to inter-observer agreement analysis using Cohen’s kappa (Cohen, 1960). Data were collected number of shots and passes was 232 shots and 178 passes in international level, 287 shots and 218 passes in domestic level. Calculations were made of the $\kappa$ variable for the attacking type following 8 variables. As a result, Cohen’s kappa statistics ranged from 0.86 to 0.97 in following 8 variables. The mean variable was 0.93, which showed that the measurements were reliable. Reliability of this variable was reported previously (Link et al., 2016).

2.5. Statistical analysis

The rate of occurrence per shots in each starting zone of attack and attacking type was calculated. And, the difference between the international level and domestic level was compared by chi-square ($\chi^2$) and phi coefficient ($\phi$). Successive passes in each attacking type and starting zone of attack were expressed as mean ± standard deviation (SD). In addition, the student’s unpaired t-test was used to compare the mean number of successive passes. Statistical significance was inferred for $p<0.05$. Statistical analysis was carried out using SPSS (IBM statistical version 17.0, Chicago, United States).
3. Results

3.1. Starting zones of attacks to make the shots

The comparison of starting zones of attacks to make the shots were significant differences between the international level and domestic level ($\chi^2 = 128.8$, df = 5, $p < 0.01$). The descriptive data were listed in Table 2. The rate of AMZ was the highest value in both levels. There were significant differences in the rate of AMZ and DZ between the levels ($p < 0.01$).

<table>
<thead>
<tr>
<th>Variables</th>
<th>International level</th>
<th>Domestic level</th>
<th>$\varphi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of zones % (times)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APZ</td>
<td>10.7 (25)</td>
<td>9.2 (26)</td>
<td>0.7</td>
</tr>
<tr>
<td>AZ</td>
<td>19.0 (44)</td>
<td>22.6 (65)</td>
<td>1.0</td>
</tr>
<tr>
<td>AMZ</td>
<td>24.6 (57)</td>
<td>38.3 (110)**</td>
<td>3.3</td>
</tr>
<tr>
<td>DMZ</td>
<td>19.0 (44)</td>
<td>15.3 (44)</td>
<td>1.1</td>
</tr>
<tr>
<td>DZ</td>
<td>18.1 (42)**</td>
<td>9.4 (27)</td>
<td>2.9</td>
</tr>
<tr>
<td>DPZ</td>
<td>8.6 (20)</td>
<td>5.2 (15)</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**$p < 0.01$

APZ; Attacking penalty zone, AZ; Attacking zone, AMZ; Attacking middle zone, DMZ; Defending middle zone, DZ; Defending zone and DPZ; Defending penalty zone.

3.2. Number of successive passes in each starting zone of attack

Mean number of successive passes in each starting zone of attack was shown in Figure 3. The APZ, AZ, AMZ, DMZ, DZ and DPZ were $1.0 \pm 0.2, 1.3 \pm 0.4, 1.7 \pm 1.0, 2.7 \pm 1.3, 3.7 \pm 2.1$ and $3.5 \pm 2.1$ in international level, $1.0 \pm 0.1, 1.4 \pm 0.2, 1.6 \pm 1.2, 2.1 \pm 1.3, 3.0 \pm 1.6$ and $2.8 \pm 2.0$ in domestic level, respectively (mean ± SD). There were significant differences in the DMZ, DZ and DPZ between levels ($p < 0.01$).

3.3. Attacking type to make the shots

The comparison of attacking type to make the shots were significant differences between the international level and domestic level ($\chi^2 = 144.8$, df = 7, $p < 0.01$). The descriptive data were listed in Table 3. The rate of KI was the highest value at 27.2% in international level. In the domestic level, the rate of SB the highest 27.5%. There were significant differences in the rate of KI and FK between the levels ($p < 0.01$).

![Figure 3](image.png)

*Figure 3* Mean number of successive passes in each starting zone of attack in international level (n = 178: dark bars) and domestic level (n = 218: light bars). Significant difference (**; $p < 0.01$). APZ; Attacking penalty zone, AZ; Attacking zone, AMZ; Attacking middle zone, DMZ; Defending middle zone, DZ; Defending zone and DPZ; Defending penalty zone.
3.4. Number of successive passes in each attacking type

Mean number of successive passes in each attacking type was shown in Figure 4. The attacking type was classified into 3 categories. The FK, CK, KI, GK and SB, LB, GP were 1.8 ± 1.2, 3.6 ± 1.8 and 2.0 ± 1.1 in international level, 1.9 ± 1.0, 2.7 ± 1.4 and 1.8 ± 1.2 in domestic level, respectively (mean ± SD). There was a significant difference in the GK between levels (p < 0.01).

Table 3 Attacking type to make the shots in international level (n = 232) and domestic level (n = 287).

<table>
<thead>
<tr>
<th>Variables</th>
<th>International level</th>
<th>Domestic level</th>
<th>ϕ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attacking type % (times)</td>
<td>FK (6.9 (16))</td>
<td>13.2 (38)**</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>CK (3.9 (9))</td>
<td>3.8 (11)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>PK (0.9 (2))</td>
<td>1.0 (3)</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>KI (27.2 (63)**)</td>
<td>13.6 (39)</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>GK (5.5 (13))</td>
<td>3.1 (9)</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>SB (22.4 (52))</td>
<td>27.5 (79)</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>LB (19.4 (45))</td>
<td>22.8 (65)</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>GP (13.8 (32))</td>
<td>15.0 (43)</td>
<td>0.4</td>
</tr>
</tbody>
</table>

** p < 0.01
FK; Free kicks, CK; Corner kick, PK; Penalty kick, KI; Kick-in, GK; Goal Kick, SB; Stealing the ball, LB; Loosing the ball and GP; Goalkeeper’s pass.

4. Discussion

This study was the first attempt to match-performance analysis in amputee soccer. Therefore, the purpose of this study was to clarify attacking aspects focused on the initiation of attacks in amputee soccer comparing with different competitive level. This study evaluated quantitatively using match-performance analysis such as starting zones of attacks, number of successive passes, and attacking type. Results of this study showed that the attacking aspects differ depending on the competition level.

The rate of starting zone of attacks was the highest in AMZ both levels. The previous study for regular soccer has been reported that the attack started from DMZ was the highest at 40% or more (Nakayama et al. 2015). The difference between amputee soccer and regular one was found. As for the difference by the competition level in the amputee soccer, there were significantly in the AMZ and DZ between international level and domestic level. In particular, this study showed that characteristics of the international level was high rate of attack from backward zones (DMZ, DZ and DPZ) in 54.6%. The initiation of attacks is considered to include regaining the ball from opponents. For example, if defending players apply pressure in areas closer to the opponent’s goal, they will be
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utilizing the high-pressure style. In contrast, the low-pressure style of play involves the defensive players only applying pressure on the opponents in the defensive half of the pitch (Fernandez-Navarro et al., 2016). Domestic level scored high rate of attack in front zones (APZ, AZ and AMZ), more than 70%. This result can be defined as a high-pressure style. Fernandez-Navarro et al. (2016) suggested that using a high-pressure style of play could be effective for regaining the ball due to time and space denied to opponents, while increasing the chances of scoring opportunities. However, a high-pressure style could cause a risky situation for the defensive team due to the space produced behind the defensive players or the space between players in case that the team failed to keep compactness. At the domestic level, it was suggested the effective to acquire the ball in attacking zones by high pressure for the attack. On the other hands, international level had also higher rate of attack from defending zones. Thus, it would be required to regain the ball and attack in the wide range, in the high competition level. The difference by the competitive level are presumed to be affected on the possession ability of individual and/or team.

Mean number of successive passes for attack from each defending zone were significantly higher the international level comparing with the domestic level. International level would have superior in possession play than domestic level. While the number of successive passes alone cannot be used to evaluate the quality of attacks, some studies have examined the effectiveness of possession play. Hughes and Franks (2005) stated that possession play produced more goals per possession than the direct play. The use of backward passes moves the ball further from the opponent’s goal. In addition, an increase in backwards passes is more likely to increase the time taken to reach the opponent’s goal. On the other hands, possession play might also use backwards passes to create space and new opportunities to attack. Tenga et al. (2010a) reported that higher-ranked teams used possession play to break the balance of the opponent’s defense, then reached the shots and goals. Therefore, it will be required attack with possession play in high competition level. The possession play is an important attacking style in amputee soccer. It is also important to increase the skills of successive passes in order to possession play. Moreover, mean number of successive passes from GK was significant difference between levels. One of the factor would be difference in positioning ability of the field player which draws out the pass from the goalkeeper between competitive levels. Others, the pass skill of the goalkeeper will be affect. In addition, it is necessary to consider tactical differences according to the scale of the event.

Then, it describe results of attacking type. The attacking type to make the shots was the higher rate of the re-start play in both levels, more than 30%. And, in-play attacks from SB and LB were about 20 to 25% respectively. In addition, the international level has higher rate of KI compared to the domestic level. At the initiation of attacks, the players need to consider not only the place to regain the ball, but also the means to get the ball back. Likewise, coaches should provide those information. Previous study for regular soccer showed that goals result from FK or CK were between 25% and 35% of in analyses of World Cups from 1982 to 2014 (Link et al., 2016). Similarly, this study suggested the importance of re-start play in the amputee soccer. The KI can be said to be an effective attacking type that creates opportunities for shots in amputee soccer, because is applied rules to correspond indirect FK. In other words, players can take a planned position at the time of KI. It will be important to improve the quality of attacks using KI in amputee soccer.

The findings on the attacking aspects of amputee soccer are as follows.

- The possession play was an important attacking style in amputee soccer, particularly international level.
- The high competition level was important to regain the ball and attack in the wide range.
- The KI was an effective attacking type that create opportunities for shots at higher competitive level.

This information can be used when coaches and players plan and practice how to take advantage of an opponent’s choice of playing tactics in a competitive match. From results of this study, it was suggested that necessary to familiarize the possession play which lead to attack by increasing the number of passes from the back of itself, in order to improve the domestic level in Japan. It is also important to increase understanding and skill of tactics based on the possession play.

Limitations of this study should be noted. Con-
textual variables (e.g., substitution of players, opposition level) were not measured. And, it is expected that the opponent’s competition level and tactics will be affected the attack style. Therefore, it is necessary to accumulate enough data to determine the attack style. Further research would like to consider the efficiency and effectiveness of attacking styles together with the result of performance (that is, probability of score). It will be necessary to evaluate the end of attacking zone, when considering the goal acquisition. In those cases, study would be also required to divide the zone into side ways and analyze in more detail. We hope to analyze more accurate attacking style in future studies.

5. Conclusions

This study showed that the attacking aspects were differences depending on the competition level in amputee soccer. And, it was suggested that need to familiarize the possession play in order to improve the domestic level in Japan. Moreover, this study found importance of the re-start play in particular KI for the high competitive level.

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