

NOTATIONAL ANALYSIS OF THE CADET AND JUNIOR SINGLES TABLE TENNIS FINALS AT THE 2013 ASIAN CHAMPIONSHIP

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The purpose of this paper was to provide a comparison between the two finals of the elite cadet and junior table tennis players. The 2013 Asian singles cadet and junior final matches were notated live and video recorded for further post-analysis. Junior players demonstrated a more variable serve placement strategy and favored the more aggressive topspin cross table return deep into the oppositions forehand. Work rate time was marginally greater per game in the junior finals (cadet vs. junior; $3.1\text{s} \pm 1.7$ $3.3\text{s} \pm 1.8$) however junior players had a greater average rally length ($5.3\text{ s} \pm 2.6$ and 4.4 ± 0.9) and greater number of high velocity top spin shots (21.5 ± 5.5 and 14.9 ± 5.6). Physicality and aggressive playing style increases with both age and ability level. These data provide a start to inform coaches of the progression between the top levels at both age groups.

KEY WORDS: cadet, junior, notational analysis, shot selection, table tennis.

INTRODUCTION: Recent investigations provide evidence to support previous anecdotal claims of Asian dominance in table tennis (Maligoli Lanzoni et al., 2013; Zhang et al., 2013). Explanations for the superiority of senior Asian players have been attributed to a more effective serve and more aggressive shot selection (Djokic, 2002; Lino and Kojima, 2009; Maligoli Lanzoni et al., 2013; Zhang et al., 2013). With playing styles developed in the early years of training, the development of athletes from the younger age groups into senior levels is critical (Maligoli Lanzoni et al., 2013). Research concerning elite senior players has investigated technical proficiency (Djokic, 2002; Lino and Kojima, 2009), game strategy and playing styles (Drianovski and Otcheva, 2002; Zhang et al., 2013) and the physiological demands of table tennis (Yuza, 1992). However there is a dearth of research concerning high-level youth table tennis. In particular, there has not been quantification of the development in technical strategy at the younger age groups. This information is vital for coaches and sport scientists to enhance the player pathway from youth to the senior international elite stage. The aim of this study was to compare the differences in technique and physiological demands in cadet (under 16 years) and junior (17-20 years) elite table tennis players in their respective finals of a major international youth championship.

METHODS: Data were collected at the 19th Asian Cadet and Junior Table Tennis Championships, Doha. The Cadet (China 113 vs China 115) and junior (China 1 vs. Korea 30) singles finals were selected for analysis. A total of 6 games were analysed for cadet and 7 for junior. Each game ended with the winning player reaching 11 or taking a subsequent 2 point lead. Video data were recorded (Casio EX-ZR1000, 60 Hz) from two elevated positions to capture player movements and shot characteristics. Live notational analysis was used to determine serve and return placement, shot characteristics (Dartish Easytag, Fribourg, Switzerland), point outcome and work/rest ratios (iCoda2, Sportstec, Sydney, Australia). The table was divided into six areas so that the serve and return could be characterized to be either short or long and left, right or middle. Shot types were grouped using a modified version of a

previously established classification system (figure 1). Shot outcome was deemed to be either a win or loss further characterized as a forced or un-forced error. A forced error was identified as when a player was unable to return the ball to the opponent's side of the table as a direct result of the previous shot from the opponent. An un-forced error was one where the sole cause of the miss was the individual's. Work was determined from first ball contact until the point was won outright, and rest time any time that was not deemed work during each game.

Table1
Shot selection definitions adapted from Maligoni Lanzoni et al., (2013)

Shot Type	Definition
Topspin	Attacking stroke imparting topspin onto the ball. Usually played at speed.
Loop	Defensive stroke when the player is far from the table, hitting the ball to a height and slowing play.
Push	Passive stroke imparting back spin onto the ball to place it short over the net.
Slice	Defensive stroke imparting high velocity lateral spin to the ball, slowing it down.
Smash	Attacking stroke characterized with a linear trajectory and no spin. Applied from eye height or above.
Block	Defensive shot, placing the bat in front of the ball. Uses the opponent's ball speed and spin.

Statistical analysis: Percentages for the total serve and return placements were calculated for both cadet and junior matches. Numerical means (\pm SD) were calculated for shot selection for the cadet and junior finals for comparison. A chi squared test was used to test for significant differences in distributions between finals based on expected statistical serve and return placement in elite seniors by Malagoli Lanzoni et al. (2013). The alpha level was set at $p < 0.05$.

RESULTS: The majority of serves in both final matches bounced in the short middle zone (77.1% and 67.7% for cadet and junior respectively). The junior final showed a large proportion of serve placement in the short left zone (23.9%) while the cadet final showed no specific focus beyond short middle. The dominant return placement for both the cadet and junior final was short middle (38.8% and 35.9%). Juniors focused the majority of returns long left and middle (24.3% and 23.3%) in the final compared to a relatively spread long distribution in the cadet final (16.3%, 18.8% and 10.0% for long left, middle and right).

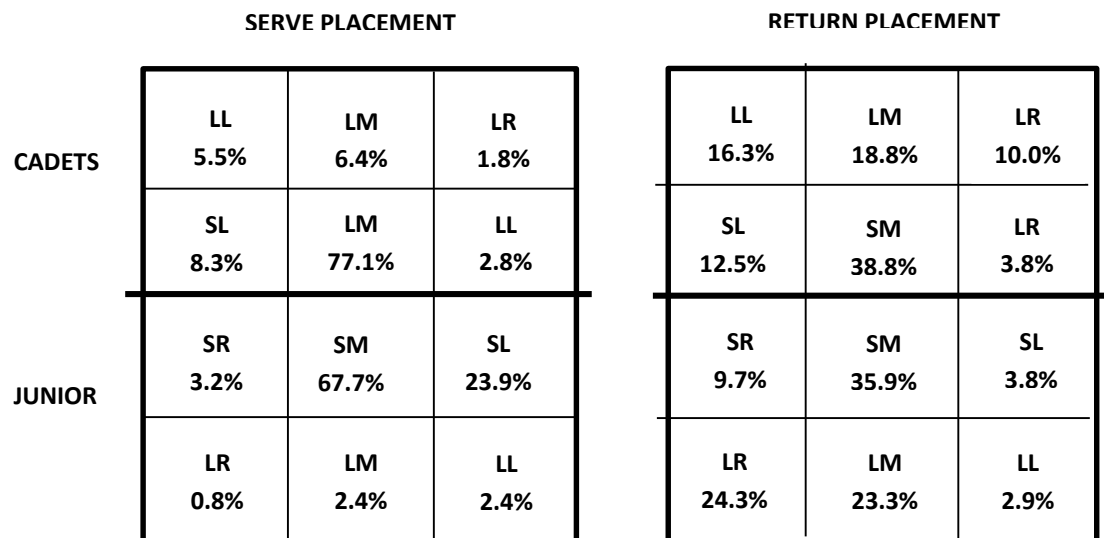


Figure 1: Serve and return placement. Percentages represent where the ball bounced in the oppositions half of the table. The thick middle line represents the net (SL = short left, SM = short middle, SR = short right, LL = long left, LM = long middle and LR = long right).

Significant differences ($p < 0.05$) were found between the youth finals for both serve and return distribution and also with youth vs senior comparisons.

Topspin was the predominant shot type in both the cadet final (14.9 ± 5.6) and the junior final (21.5 ± 5.5). Cadets showed a significantly ($p = 0.01$ and 0.05) higher average defensive push and loop shot (7.1 ± 4.7 and 7.2 ± 2.4) than juniors (4.3 ± 3.9 and 5.1 ± 1.7). More points were won in the junior final through forcing opponent errors (5.7 ± 2.9 and 4.3 ± 1.8). Juniors showed a greater rest time per point ($22.4s \pm 9.9$) than cadets ($17.8s \pm 5.7$). The junior final also showed a higher average rally length per point than the cadet final (4.4 ± 0.9 and $5.3s \pm 2.6$) in a similar work time ($3.3s \pm 1.8$ for cadets and $3.2s \pm 1.7$ for juniors).

Table 2: Mean (\pm SD) shot type and winning point outcome per game. Point length (no. shots) and work and rest times are shown per point. (* $p < 0.05$).

	Cadet	Junior
Shot Type		
Topspin (n)	14.9 (\pm 5.6)	21.5 (\pm 5.5)*
Loop (n)	7.1 (\pm 4.7)	4.3 (\pm 3.9)*
Push (n)	7.2 (\pm 2.4)	5.1 (\pm 1.7)*
Smash (n)	0.1 (\pm 0.3)	0.6 (\pm 1.2)
Slice (n)	0.3 (\pm 0.5)	0.7 (\pm 1.6)
Block (n)	0.8 (\pm 0.7)	0.8 (\pm 0.8)
Winning Point Outcome		
Forced Error (n)	4.3 (\pm 1.8)	5.7 (\pm 2.9)*
Unforced Error (n)	13.7 (\pm 1.9)	12.4 (\pm 3.9)
Work Rate Per Point		
Shots (n)	4.4 (\pm 0.9)	5.3 (\pm 2.6)
Work (s)	3.3 (\pm 1.8)	3.2 (\pm 1.7)
Rest (s)	17.8 (\pm 5.7)	22.4 (\pm 9.9)

DISCUSSION: For both the cadets and junior finals, primarily the players targeted the short middle zone for the majority of serve placements (77.1% and 67.7%). The second highest placement was short left, interestingly with a much higher percentage by juniors (23.9% and 8.3%). The short middle zone is viewed as the safest and most effective serve placement due to the difficulty for the opponent to make a threatening attack with the ball bouncing close to the net in the middle of the table. This then allows the serving player to attack on their turn (Djokoic, 2002, Malagoli Lanzoni et al., 2013). In this investigation the cadets demonstrated a more consistent serve placement to the short middle suggesting a safer serving strategy according to Malagoli Lanzoni et al., (2013).

However the high consistency may not be as effective when faced with opponents exploiting a repetitive strategy. The larger distribution to short left in the junior final shows greater variation. At senior level Malagoli Lanzoni et al. (2013) observed that the short middle serve placement percentage was lower still (52.4%) with a greater distribution to both short side zones (14.7% each) suggesting that variable short serve technique may be a strategy developed with experience. Interestingly cadets in this case study served a slightly higher total percentage long (13.7%) compared to the juniors (5.6%) suggesting better accuracy in the older players.

Short middle was the dominant return in both the cadet and junior finals (38.8 % and 35.9%). The long middle placement was second highest in the cadet final (18.8%) displaying relatively safe tactics. The juniors, in comparison, show an interesting pattern with long right receiving the

second highest percentage of returns (24.3%) closely followed by short middle (23.3%). This strategy was observed to be a strong forehand topspin returned deep into the opposite area played to the opponent's backhand. Djokovic (2002) found that better players quickly gain the advantage with a successful topspin return of the serve reclaiming an attacking advantage. These results are indicative of juniors attacking from the first return perhaps with the tactical placement to move the serving player across the table, enticing a weaker shot in reply.

Juniors played more topspin shots in the final per game (21.5 ± 5.5 vs. 14.9 ± 5.6) accounting for 50.3% of total shots compared to 43.2% by cadets. The topspin forehand is one of the fastest and most aggressive shots in table tennis (Lino and Kojima, 2009) showing a difference in offensive play in the two age group finals. This is supported further with the cadet final showing a significantly greater number of defensive type shots (7.2 ± 2.4 and 7.1 ± 4.7 for push and loop) compared to the juniors (5.1 ± 1.7 and 4.3 ± 3.9). These results indicate that the juniors applied a strategy to out power the opponent with high velocity shots reducing the reaction time and increasing the difficulty for a shot to be played in return. The top forehand has been associated with forced errors more than any other shot type (Maligoli Lanzoni et al., 2013) and with winning players dominating play with this stroke (Djokic, 2002). The junior final averaged a greater number of forced errors per game (5.7 ± 2.9 vs. 4.3 ± 1.8) therefore further highlighting the difference in aggressive play in the two age group finals.

Work rate average was marginally longer per point in the cadet final ($3.3s \pm 1.8$ and $3.1s \pm 1.7$). However this may not reflect work intensity and the physical effort demonstrated in the junior final as the juniors displayed a greater average rally length in the shorter time (5.3 ± 2.6 and 4.4 ± 0.9). This is explained with the greater number of high velocity topspin shots played in the junior final taking less time to cross the table to the opponent, leading to a greater shot count. This information may be useful to coaches for the physical preparation of athletes at the different age groups.

At senior level, a work time of $6.8s \pm 4.2$ and an average of 8.5 ± 4.9 strokes per point (Yuza et al., 1992) support that the shot count per point and work rate increases with age and experience. However these comparative findings were obtained prior to recent rule changes to the current format to create a quicker and more dynamic game.

CONCLUSION: The junior final demonstrated greater variation in serve placement than the cadet final while also using a more specific return strategy to the opponent that is suggestive of attacking play. The junior final showed a significantly higher percentage of aggressive topspin shots with lower passive push shots and defensive loops. This resulted in more forced winners and a quicker game. Although work time was similar in both age group finals, a greater number of shots occurred per rally in the junior final. This suggests that physical demand may increase with age and experience. Beyond this case study of the two final matches, further investigations need to be carried out to clarify these findings on a broader scale.

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