

# MEASURING SQUASH HITTING ACCURACY USING THE 'HUNT SQUASH ACCURACY TEST'

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The purpose of this study was to determine the reliability and validity of the Hunt Squash Accuracy Test (HSAT). **Reliability:** ten male squash players performed the HSAT twice within seven days. Each test consisted of 375 shots across 13 different types of squash strokes on both the forehand and backhand side. Reliability was measured using a typical error (TE) score from consecutive pairs of trials. The overall TE score for the test was 1.82%, demonstrating that the HSAT is very reliable at the 90% confidence limit. **Validity:** measured using a correlation analysis comparing the results of 8 individual's HSAT scores against a round-robin tournament ranking where all 8 players played against each other, as well as coach rankings of player ability. Validity was considered high with correlation coefficients of 0.93 for both the round-robin and coach ranking.

**KEY WORDS:** squash, performance, reliability, validity.

**INTRODUCTION:** In a squash match, points and games can be won by gaining an upper hand by putting an opponent out of position by accurately hitting the ball to a strategic position (Lees, 2003). The ability to hit a shot accurately is a fundamental skill for squash athletes and one that is developed over time (Ariff, Osman, & Usman, 2012). The ability to reliably assess this skill is paramount in the development of athletes to track their progress over time. While there has been some literature evaluating accuracy of shots in other racket sports; tennis (Strecker, Foster, & Pascoe, 2011); badminton (Sakurai & Ohtsuki, 2000), as yet there appears to be no literature assessing this important skill for squash players for any of the different strokes.

One test that is currently used by some squash coaches to assess shot hitting accuracy is a test that was developed by squash coach Geoffrey Hunt; the "Hunt Squash Accuracy Test" (HSAT). This test aims to evaluate an athlete's shot hitting accuracy across 13 different types of squash strokes on both the forehand (FH) and backhand (BH) sides. It is also currently used to track the progress of junior players across their development. However, the reliability and validity of the HSAT is yet to be determined. The aim of this study is to therefore determine the reliability (typical error) of the HSAT and to begin to investigate the validity of the test against player ability (tournament and coach ranking).

**METHODS:** HSAT: The HSAT consists of 375 shots across 13 different types of squash strokes on both the forehand (FH) and backhand (BH) side. These included: drives, volleys, boasts, and drop shots (see Table 1 for shot type and number of trials performed). Each shot had a target area that the ball had to land in to be called successful. The players hit the ball continuously for all drive strokes (middle, back and volley) and accrued a score based on the number of shots landing in the target area (not including the first shot), while the remaining strokes (boast and drop's) were hit off a fed ball from an experienced coach, with 3-5 s between feeds. The players had approximately 30 s between each different stroke test. The total score was expressed as a percentage of successful shots that hit the target area over the total number of shots taken.

Reliability: Ten male squash players ( $17.3 \pm 6.4$  y) performed the HSAT twice within 7 days. Each player was familiar with the test protocol having previously performed the test a number of times. Reliability was measured using a typical error (TE) score from consecutive pairs of trials, as described by Hopkins (2000).

Validity: Eight junior male squash players ( $14.8 \pm 1.9$  y) performed the HSAT to determine their overall accuracy score. The eight squash players then competed in a 'round-robin' tournament where all athletes played each other once in a best of five game match according

to the World Squash Federation international rules. The eight squash players were also ranked on overall squash playing ability by their coach, who had been training them all full-time (15 hours/week) for  $1.5 \pm 0.6$  years. The coach rankings were entered prior to the start of the tournament to avoid any bias. The scores from the HSAT were then compared against the rankings obtained from the round-robin tournament as well as the coach rankings using a correlation analysis.

**RESULTS:** The individual TE scores for each stroke as well as the total overall TE score for the HSAT are presented in Table 1.

**Table 1**  
**TE Scores for the HSAT**

Shot Type	Max Score	TE	% TE
FH Drive Middle	50	3.48	6.96
BH Drive Middle	50	1.66	3.32
FH Drive Back	25	1.45	5.80
BH Drive Back	25	1.17	4.68
FH Volley Drive	25	1.54	6.16
BH Volley Drive	25	1.64	6.56
FH Volley Drop	25	2.09	8.36
BH Volley Drop	25	2.32	9.28
FH Boast	25	1.50	6.00
BH Boast	25	2.52	10.08
FH Drop	25	1.47	5.88
BH Drop	25	1.83	7.32
Volley Mixed	25	0.97	3.88
Total Overall Score	375	6.94	1.85
Overall % Score	100	1.82	1.82

The overall HSAT scores, rankings from the round-robin tournament, coach's rankings and corresponding correlation coefficients are shown in Table 2.

**Table 2**  
**Player Scores for the HSAT, Rankings from the Round-Robin (R-R) and Coach, Correlation Coefficients**

Player	HSAT Score	R-R Rank	Coach Rank
A	89	1	1
B	75	2	2
C	65	5	5
D	62	3	3
E	61	4	4
F	33	6	6
G	30	8	8
H	19	7	7
Correlation coefficient compared to HSAT:		0.93	0.93

**DISCUSSION:** The HSAT is currently used to assess and track a player's ability to perform a number of different shots accurately. The overall TE score of 1.82% demonstrates that this test is very reliable at the 90% confidence limit. This research compares favourably with the research of Strecker et al. (2011), who showed no significant difference between test-retest reliability for a tennis hitting accuracy test. The most unreliable stroke of the HSAT was the BH Boast (TE 10.08%), which could indicate that this was a difficult shot to hit accurately and therefore introduced more variation between tests. This notion is supported by various coach

opinions. The most reliable stroke of the test is the BH Drive Middle (TE 3.32%). This stroke is one of the most basic and commonly played shots during a squash match and therefore could be the reason why it is the most reliable in the test (Vučković et al., 2013).

The correlation analyses showed very high correlation between both the round-robin tournament and coach ranking (see Table 2). Although not definitive, the coefficient of 0.93 is a good indication that this is a valid test when comparing the HSAT scores with that of player ability (indicated by either ranking from the round-robin tournament or coach perception) for junior athletes. A potential limitation of the HSAT with regards to validity is that there is no 'match' pressure as there would be in a game situation. This factor may account for some of the variation seen in HSAT score and the round-robin tournament ranking.

Given that the HSAT is a shot accuracy test, perhaps a more in-depth analysis of the round-robin matches and games would further assist the validation. Performance analysis variables such as 'shot errors' or 'number of tins' that somewhat represent a player's ability to hit the ball accurately under pressure could be more closely related to the HSAT scores. Further investigation with a higher number of subjects and more in-depth analysis of matches is proposed to help further validate the HSAT against player ability and performance. It is also proposed that a kinematic analysis be undertaken during the performance of the HSAT, as well as during a match, to evaluate and compare the biomechanics of accurate and inaccurate shots to determine any differences, this would further assist in the development of stroke technique and skill.

**CONCLUSION:** This study showed the HSAT to be very reliable with an overall TE of 1.82%. It also demonstrated the high validity of the test when compared to a round-robin tournament ranking as well as a rank based on an expert coach's perception, with a correlation coefficient of 0.93 for both. Overall the authors believe the HSAT to be a very reliable and potentially good measure of overall squash ability for junior players. Further comparisons with larger subject numbers (and more 'elite' level players) against match analysis statistics or notational analysis comparing error rates in matches to the score on the HSAT could further strengthen the perceived validity of the HSAT as a representation of overall squash ability.

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