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Scoring Analysis of the Men's 2013 World Championship Tour of Surfing

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The study compared scores obtained by the 10 highest and lowest ranked athletes on the men's 2013 World Championship Tour (WCT) of surfing. Significant differences ($p < .001$) were identified between the two groups' average wave scores, average total scores, and total heats competed. In addition, the average standard deviation (± *SD*) of each surfer's wave score was significantly different ($p = .020$) between the two groups. Significant moderate correlations were identified between athletes' average placing and the *SD* of their wave scores ($r = .596$, $p = .006$), and total heat scores ($r = .474$, $p = .035$). Repeated-measures ANOVA also revealed significant differences between heat scores obtained during the final and all previous rounds ($p < .001$–$.041$). In conclusion, higher ranked surfers achieved higher wave scores and heat totals, and were more consistent in scoring. On average, a 1.04 point increase per wave score would allow a bottom 10 ranked surfer to reach the top 10, a small but impactful gain.

Keywords: performance analysis, season analysis, competitive athletes, individual performance

The men's World Championship Tour (WCT) of surfing is the highest level of competitive surfing in the world, made up of an elite group of 32 athletes. To remain on the WCT from one year to the next, athletes must finish within the top 22 as an overall placing at season's end, or otherwise, requalify via the World Qualifying Series (WQS). New surfers entering into the WCT fill the bottom 10 ranking positions by achieving a top 10 place within the WQS. A typical WCT season is comprised of a series of ten competitive surfing events held at a range of locations throughout the world, in a variety of surf break types to challenge the surfers' ability. Following the conclusion of a season, each athlete is awarded a world ranking based on their eight best results achieved across these events.

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The judging of competitive surfing involves awarding a numerical score based on the ability of athletes to perform radical maneuvers with commitment, at a high level of difficulty, and in combination with other major maneuvers (ASP, 2013). To maximize their score, surfers are required to execute these maneuvers with speed, power and flow, and demonstrate a wide ranging repertoire that includes innovative or progressive techniques (ASP, 2013). Furthermore, emphasis of certain elements in scoring also depends upon the location and the conditions on the day, along with changes in conditions during the day (ASP, 2013). Waves are scored by five judges on a scale of 0–10, and each final wave score is determined by taking an average of these after discarding the highest and lowest scores awarded. During competition, surfers may catch up to 15 waves per competitive heat, and of these, the sum of the highest two scores is awarded as a total heat score (/20).

Over time professional surfing has undergone a substantial growth, and likewise an increase in the attention given to athletes on the World Championship Tour (WCT) by coaches and sport scientists (Farley, Harris, & Kilding, 2012b; Mendez-Villanueva & Bishop, 2005a; Mendez-Villanueva et al., 2005b). To date, surfing literature has traditionally investigated the physical demands of surfing through performance analysis (Farley et al., 2012b; Meir, Lowdon, & Davie, 1991; Mendez-Villanueva, Bishop, & Hamer, 2006; Secomb, 2012) and physiological testing (Farley, Harris, & Kilding, 2012a; Loveless & Minahan, 2010b; Lowdon, Bedi, & Horvath, 1989; Mendez-Villanueva et al., 2005b; Secomb, 2012; Sheppard et al., 2012; Sheppard et al., 2013). Despite this, only a limited number of research studies have reported on the results of competitive surfing (Lundgren, Tran, Dunn, Nimphius, & Sheppard, 2014; Mendez-Villanueva, Mujika, & Bishop, 2010; Secomb & Dascombe, 2012). Lundgren et al. (Lundgren et al., 2014) reported an average wave score of 6.00 ± 2.33 during the 2012 WCT season; however, these scores were recorded from every single wave on which a maneuver was performed from only the final three rounds of each event. Earlier studies have reported that surfers' end of year ranking had a strong association with a higher average heat score, but a moderately weak association with variability, across a competitive season (Secomb & Dascombe, 2012), and that heat scores indicated moderate to large variability in performance (Méndez-Villanueva et al., 2010). This variability of performance was much larger than previously reported for sports such as running, swimming, or weightlifting (Méndez-Villanueva et al., 2010). Although these contributions are helpful in the understanding of the requirements of surfing performance, there is a lack of statistical analysis of competitive surfing results.

With such limited information available on the general results/scoring of actual elite competitive surfing, it seemed appropriate to obtain a statistical overview of a competitive season. Accordingly, the aim of this study was to compare the results obtained by the top and bottom 10 ranked WCT surfers (1st to 10th and 23rd to 32nd world rank, respectively) over a season, to determine if there is a definitive elite group within the WCT. This includes the i) average two best wave scores per heat, ii) average total heat score, and iii) variability (± *SD*) of each surfer's heat results.

Method

All ten events of the 2013 WCT season (Table 1) were analyzed using results of the 10 highest and 10 lowest ranked WCT surfers at the end of the competitive season.

Justification for these categories is that being a Top 10 surfer is considered a career milestone and can garner significant attention and remuneration through bonuses from the athlete's employers (e.g., sponsors who use the athletes as ambassadors). In contrast, ranking in the bottom 10 means that the athlete will not remain on the WCT for the following year, unless they requalify through the WQS.

All data were obtained from the official event websites; this included the top two scores per heat, heat total scores, and total number of waves caught. From this information the averages (± *SD*) per athlete and event were calculated. In addition, the total heats surfed throughout the competitive year and the average heats surfed per competition were calculated to determine how many scores were included in the calculation of average scores. This was compiled for every heat, for every round, for every event in the 2013 WCT. In addition, the average scores from each round throughout the season were calculated for three groups; top 10, bottom 10, and winners of each event, to determine changes in performance across rounds within the events. The research protocols were approved by Edith Cowan University Institutional Review Board (IRB).

Participants

Data from the 32 elite male surfers competing in the 2013 WCT season were collected. Athletes that did not compete in at least eight events were excluded due to the WCT ranking criteria requiring eight competition results. Furthermore, one athlete who ended the season ranked 10th was excluded as a result of an injury that occurred during one of the events, before the athlete being eliminated. This led to a reduced/anomalous heat total across the year as they were unable to continue through the remainder of the contest.

Procedures

The surfing contests are based on eight rounds of competition per event, with surfers receiving numeric scores between 0–10 per wave caught (Table 2). Surfers

Table 1 2013 WCT Event Locations (in Order of Events)

Beach/break	Location	Break type
Gold Coast	QLD, Australia	Point break
Bells Beach	VIC, Australia	Point and rocky
Rio de Janeiro	Brazil	Beach
Tavarua/Namotu	Fiji	Reef
Keramas	Bali, Indonesia	Reef
Teahupoo	Taiarapu, Tahiti	Reef
Trestles	CA, USA	Beach and rocky
South West Coast	France	Beach
Peniche/Cascais	Portugal	Beach and reef
Banzai Pipeline	Oahu, Hawaii	Reef

Table 2 WCT Scoring Guidelines

Quality of ride	Score awarded
Poor	0–1.9
Fair	2.0–3.9
Average	4.0–5.9
Good	6.0–7.9
Excellent	8.0–10.0

generally catch numerous waves, up to the 15 wave limit, during a competitive heat, but it is only the top two scores that count toward their heat total. Hence, it is only these two scores, for each surfer, from each heat, that were used for analysis.

On the WCT, heat formats vary through the competition between two and three man heats, but regardless, to advance, the surfer must win the heat by having the highest total heat score. All two man heats are elimination heats, meaning that the losing surfer is eliminated at that point in the competition. Depending on the round in which they have been eliminated, surfers are allocated a number of points toward their world ranking between 500 (equal last place) and 10,000 (winning the event). Table 3 outlines the competition procedures for a Men's WCT competition and points allocated for placing.

Statistical Analysis

Descriptive statistics are used throughout the study and are presented as averages (± *SD*) to represent centrality and spread of data. A One-Way ANOVA was performed on all measures to determine differences in the variables of interest between the top and bottom 10 athletes based on season rank. All data were assessed for sphericity using Mauchly's Test of Sphericity. In the event of the assumption of sphericity being violated, the Greenhouse-Geisser correctional adjustment was used. Where a significant main effect was identified, a Least Significant Difference (LSD) post hoc test was used to identify individual statistical differences. In addition, Pearson's correlation coefficient was calculated between the standard deviation of total heat scores and the average competition placing for each athlete, with the following r value ranges to determine correlation strength: 0.0–0.2 = very weak; 0.2–0.4 = weak; 0.4–0.6 = moderate; 0.6–0.8 = strong; 0.8–1.0 very strong. Furthermore, a repeated-measures ANOVA between the average heat total scores of rounds 1–8, over the 10 WCT events, from the top and bottom 10 surfers combined was performed to determine whether there were differences in scores obtained based on the competitive round. All statistical analyses were performed using a statistical analysis package (SPSS, Version 22.0; Chicago, IL) with statistical significance set at $p \leq .05$.

Results

The average (± *SD*) wave scores (n = 1342) and total scores (n = 671) for the top 10 surfers were 7.01 ± 1.93 and 14.02 ± 3.38, respectively, whereas values from the

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Table 3 Men's 2013 WCT Event Format Procedures Outlining the Number of Heats Per Round, Number of Surfers in Each Heat, Progression/Elimination, and the Placing (WCT World Ranking Points in Parentheses)

Round	Number of heats	Number of surfers per heat	Progression
1	12	3	First place advances to round 3
			Second and third place advance to round 2
2	12	2	First place advances to round 3
			Second place eliminated, 25th place (500)
3	12	2	First place advances to round 4
			Second place eliminated, 13th place (1500)
4	4	3	First place advances to the Quarter Finals
			Second and third place advance to round 5
5	4	2	First place advances to the Quarter Finals
			Second place eliminated, 9th place (4000)
Quarter finals	4	2	First place advances to the Semifinals
			Second place eliminated, 5th place (5200)
Semifinals	2	2	First place advances to the Finals
			Second place eliminated, 3rd place (6500)
Finals	1	2	First place wins the event (10000)
			Second place (8000)

bottom 10 were 5.97 ± 2.13 and 11.95 ± 3.59, respectively. This corresponds to a 14.7% difference between the groups' total heat scores. One-Way ANOVA revealed that there were significant differences ($p < .001$) between the top and bottom 10 surfers' average wave score, average heat total score, and total heats competed in. The average standard deviations (± *SD*) of the individual wave scores were significantly different ($p = .020$) between the top (1.93) and bottom (2.13) 10 surfers.

Figure 1 displays the comparison between the top and bottom 10 surfers' average wave scores and heat totals for the across all events from the 2013 season.

Table 4 presents an overview of the standard deviations of the wave score and heat total, as well as total heats competed in over the season and the surfers' average placing per event.

A significant moderate correlation was recorded between each surfer's average placing and the SD of their scoring wave scores ($r = .596$, $p = .006$), and their total heat scores ($r = .474$, $p = .035$).

Figure 2 displays an overview of the average scores from each round throughout the season. Scores tend to increase from round 1–8, with the higher scores generally recorded during the elimination rounds (see Table 3 for competition format). Further analysis by repeated-measures ANOVA revealed significant differences

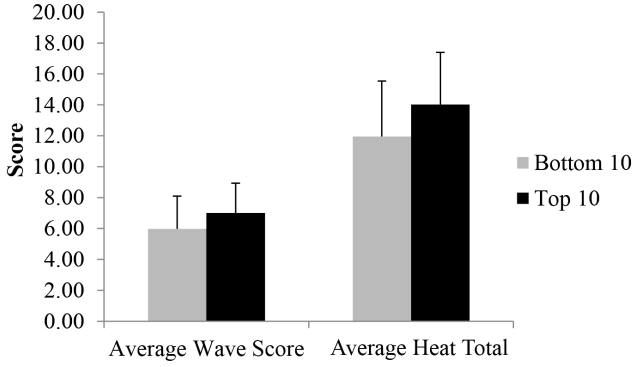

Figure 1 — Average (± *SD*) wave scores and heat totals from the top and bottom 10 surfers across the 2013 WCT season.

Table 4 The 2013 WCT Season Rankings, Standard Deviations of Wave Score and Heat Total, Total Heats Competed in, and Surfers' Average Placing from Every Event

Ranking	*SD* of wave score	*SD* of heat total	Total heats	Average placing
1	1.64	2.72	59	3.9 ± 2.23
2	1.73	3.14	45	7.5 ± 7.74
3	1.53	2.67	47	6.5 ± 4.97
4	1.72	2.96	42	6.8 ± 4.41
5	2.14	3.61	44	8.8 ± 6.70
6	2.17	3.72	42	7.1 ± 4.18
7	1.91	3.43	43	8.0 ± 4.74
8	1.99	3.41	40	11.0 ± 8.42
9	2.10	3.66	40	9.4 ± 6.85
11	1.90	3.55	39	10.0 ± 6.20
Average	**1.93**	**3.38**	**44.1 ± 5.78**	**7.90 ± 5.64**
22	2.29	4.04	26	17.8 ± 7.96
23	2.00	3.25	26	18.2 ± 7.32
23	2.08	3.58	25	18.2 ± 7.32
25	2.25	3.38	23	18.3 ± 8.25
26	1.87	3.37	21	18.6 ± 6.85
27	1.82	2.73	20	18.0 ± 7.93
27	2.27	3.73	20	18.0 ± 7.93
29	2.40	4.29	23	19.0 ± 6.32
29	2.07	3.73	22	19.0 ± 6.32
31	2.14	3.77	20	21.4 ± 8.10
Average	**2.13**	**3.59**	**22.6 ± 2.41**	**18.65 ± 7.43**

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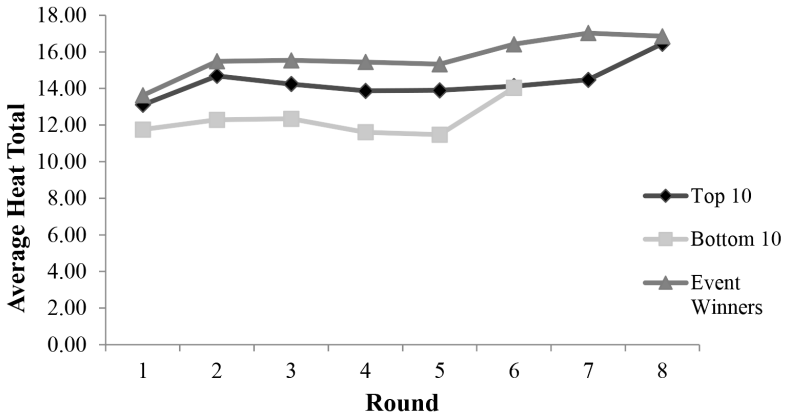

Figure 2 — Average total heat scores across rounds over the 10 WCT events.

($p < .001$–0.038) between the heat scores obtained during round 1 compared with rounds 4, 6, 7, and 8. Significant differences ($p < .001$–0.041) were also observed between the heat scores obtained during round 8 (final) and all previous rounds.

Discussion

The World Championship Tour for men consists of the 32 top ranked surfers in the world, who are judged on a scale between 0–10 on the execution of maneuvers while riding waves during competition. To date, only a limited number of research studies have reported on the results of competitive surfing. Accordingly, the aim of this study was to compare and statistically analyze the results obtained by the WCT surfers over the 2013 season, with a particular focus on determining the differences between the highest achievers (i.e., the Top 10) and the athletes who are not in a position to remain on the WCT.

This study demonstrated that within the WCT there is a notable difference between the overall performance of the top and bottom 10 ranked surfers, suggesting there is a definitive elite group within the world's best surfers that make up the WCT. This is characterized by a 14.7% difference between total heat scores obtained by the top and bottom 10. The higher the total heat score (total of two highest scoring waves) the more likely the surfer will defeat their opponent(s) and advance onto the next round of surfing, thus accumulating more season points and achieving a higher end of season ranking. The top 10 surfers scored on average 1.04 more points per scoring wave, and 2.07 per two wave heat total, compared with those of lower rank. When put in the perspective of individual wave scores, to athletes and coaches in the sport, this represents what most would consider a small difference. Despite this, the difference between finishing top 10 vs bottom 10 is very large, and perhaps career-defining.

The *SD* of the average wave score for the top 10 surfers (1.93) was lower than that of the bottom 10 (2.13), indicating that the top 10 surfers are more consistent in their two highest scores per competition heat. As a result, consistency of the wave

score can be suggested as being an essential component of competitive surfing. It appears that within this elite group, it is those athletes who have less variability (i.e., fewer poor results), as well as higher scores on average, that achieve greater success. This is supported by a significant moderate correlation reported between each athlete's *SD* of the wave score and their average placing across the season. The importance of consistency was also demonstrated by the overall winner of the 2013 season. The winner had an average placing of 3.9 per event, plus one of the lowest *SD* of scoring wave scores and heat totals (Table 4), despite having lower average wave scores and heat totals than those who finished second, third, and fourth in season rankings. These results are in agreement with Secomb & Dascombe (2012), who reported significant associations between end of season rank and variability in average heat scores across the 2007, 2008, and 2009 WCT seasons.

It was acknowledged that due to the competition format (Table 3), surfers who win heats in certain rounds will advance through and skip a round, potentially bringing down their total number of heats in the analysis. Furthermore, surfers who advance past round 3 (mostly those ranked in the top 10) could potentially compete in double the number of heats than those who were eliminated in round 2 or round 3 (mostly those ranked in the bottom 10). As a result of these two situations, some surfers' average wave scores and heat totals may be compromised due to the fact that the average would encompass scores from fewer heats.

Significant differences were recorded between the heat scores obtained during round 8 (final) and all previous rounds, suggesting the use of a pacing strategy by which surfers improve their performance as they advance through rounds, therefore attaining higher scores as they progress (Figure 2). It should be noted that this trend was also observed in scores achieved by athletes who won events. This suggests that the increasing average scores over the rounds were not necessarily solely the result of lower scoring surfers being eliminated as the rounds progressed. However, it must be acknowledged that during an event, contest organizers are aiming to complete each subsequent round in better conditions if the weather allows, thereby allowing the athletes to achieve higher scores (i.e., barrel rides, bigger and more critical waves), which could have had a considerable impact on scores rising toward the finals. Furthermore, rounds 2 and 3 are elimination rounds, which may explain why scores in these heats were higher than those of the nonelimination rounds of 1, 4, and 5. The analysis indicated that throughout the 2013 season only four surfers in the bottom 10 reached the quarter finals, with none advancing as far as the semifinals. This reiterates the previous comment that there are notable differences between the overall performance of the top and bottom ranked surfers in the WCT. However, it should also be considered that there are other factors that can influence the scoring and progression through rounds, such as the environment surfing takes place in.

Due to the many variables associated with surfing and the ever changing environmental conditions, scores obtained are likely to vary due to the interactions of these variables. Random low scores are likely to be attributed to the unique variables associated with the different surf locations, such as wave height, break type, and wave formation, which would ultimately dictate the execution of maneuvers and scoring potential. In addition, surfing performance can also be influenced by a wide range of internal and external factors such as psychological, tactical, cognitive, and biomechanical components, as well as physiological capacity, equipment,

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level of the opponents, and judging (Méndez-Villanueva & Bishop, 2005a; Méndez-Villanueva et al., 2006). Nonetheless, it appears that those of a higher ranking are likely to adapt to cope with these variables better than those ranked lower, and are able to maintain high performance and higher scores, despite the varying conditions. Despite this, judging is an external factor that cannot be controlled by the surfers. Due to its subjective nature, it is possible that judges may subconsciously provide higher ranked surfers with higher scores because they consider them as an elite subgroup of world-class surfers. Therefore, the judges may have higher expectations of their performance due to the surfers' positive reputations. While this is not necessarily the case, it is plausible, and is certainly observed in other scoring based sports such as figure skating, in which judging bias favors well-known athletes over those who are unfamiliar to the judges (Findlay & Ste-Marie, 2004).

Conclusions

This study is the first to investigate the performance of the top and bottom 10 ranked WCT surfers over a season, and to statistically analyze and compare the scores received between the two groups. The results indicate that the top 10 surfers achieve higher scores per scoring wave, resulting in higher heat total scores over lower placed surfers, therefore, progressing further per event and achieving a higher season ranking. Performance consistency appears to be a key aspect of success, and within competitive surfing it appears those who rank higher are more consistent in their performance over those who are lower placed. Furthermore, a pacing strategy by which surfers improve their performance as they advance through rounds may take place over the rounds of an event, as supported by significant differences between the heat scores obtained during the final round and all previous rounds. Even though environmental factors and variables can, and will ultimately dictate the execution of maneuvers performed while surfing and cause variation in scoring, the higher ranked surfers are still able to maintain a higher performance and scoring ability. It should be noted that the critical component is the necessity to improve season ranking, which is especially important for those within the bottom 10, who are at risk for failing to requalify for the WCT the following year. A 1.04 point increase in average wave score may allow a bottom 10 ranked surfer to reach a position within the prestigious top 10; a seemingly minimal, but highly impactful gain.

From this study, strategies to improve technique/maneuvers and observing athletes' competition scores could be used to track progress in their surfing ability as well as competitive strategy, which can be used to determine whether the coaching approaches being implemented are successful. Future studies within this field are needed to further expand the knowledge within the sport and improve practitioners' scope for performance enhancement.

What Does This Article Add?

The purpose of this study was to provide coaches/practitioners involved in competitive surfing with descriptive information about the differences in competitive results between the top 10 and bottom 10 WCT surfing athletes. With the top 10 surfers

on average scoring 1.04 more points per scoring wave, per heat, compared with the bottom 10 ranked surfers, it is clear that there are differences in ability. As such, a 1.04 point increase in average wave score may allow a bottom 10 ranked surfer to reach a position within the prestigious top 10–a seemingly minimal, but highly impactful gain. From this information, coaching staff can construct strategies by which they can help their surfers through a series of marginal improvements in technique. Furthermore, changes in athletes' competition scores could be used to track progress in their surfing ability as well as competitive strategy, which can be used to determine whether the coaching approaches being implemented are successful. This is currently not well understood in the sport of surfing in our view. Coaches may use this information to construct strategies to use during competition, as well as strategies for improving maneuver execution to increase scoring potential. For example, surfers are likely to improve their wave score by increasing the number of high-risk maneuvers performed, such as tube rides and aerials (Lundgren et al., 2014). Those who achieve a sufficient increase in average wave score are likely to advance to later rounds, improve their overall season ranking and prize money earnings, including potential for securing better sponsorship deals.

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