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A New Assessment of Surfer's Performance: A Descriptive Validation Study

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ABSTRACT

Introduction: As surfing gains more attraction to athletes who seek an action sport, these athletes would want to understand how to be successful at the sports' elements and a line of progression on how to rate and improve their surfing performance. Since surfing is not a time or distance-based sport and the current evaluation method of surf performance is achieved by a panel of judges at a surf competition, there is a need for a performance assessment for non-competitive, recreational surfers. **Purpose:** The purpose of this study was to establish face, content, and criterion validity of the surfer's performance questionnaire (SPQ) using a modified Ebel method. **Methods:** First, face validity was established by five surf coaches. This developed the SPQ into an assessment consisting of five key elements of surfing. Next, we used the Ebel method, which utilized a panel of experts to examine each item on the questionnaire. For criterion validity, the authors used the Trait Sport-Confidence Inventory (TSCI). **Results:** As a result**,** all 5 key elements had greater than 50% agreement for Ebel results and were included on the final SPQ. The overall agreement of the raters on the SPQ was good (ICC=0.877, p=0.0001). The correlation between the SPQ and TSCI ranged from very poor to moderate. **Conclusion:** These findings suggest the SPQ is a useful assessment to measure a recreational surfer's performance. Therefore, recreational surfers, surf instructors, and surfing coaches can use the SPQ to measure and assess improvement over a period of time.

Key words: Instrumentation, Survey and Questionnaires, Water Sports, Athletic Performance

INTRODUCTION

The popularity of surfing has experienced significant growth in recent years. According to a study published in the Journal of Physical Activity and Health, the number of active surfers worldwide has been steadily increasing in various countries and found that the global surfing population has grown by an estimated 25% over the past decade (Bellew et al., 2020). The surge in popularity can be attributed to several factors, including increased accessibility to surfing destinations, advancements in surfboard and wetsuit technologies, and the promotion of surfing as a recreational activity in mainstream media (Bernards, 2017; de Bona et al., 2014). This trend suggests a growing interest in surfing among individuals seeking recreational opportunities by the coast and wave pools.

As surfing gains popularity, athletes are seeking methods to be more successful while practicing and competing. Whether athletes seek surfing as a recreational activity or as a competitive sport, there needs to be a line of progression on how to rate and improve their surfing performance. One method used to analyze surfing performance is using judges to rate the surfer's performance at competitive events. Judging scores in a surf competition are determined through a standardized scoring system that considers various aspects of a surfer's performance. The surf competitor's performance on the waves is scored based on the judge's subjective logic of commitment to the wave, the degree of difficulty, the creativity and combination with progressive maneuvers, and the speed, power and flow of the surfer (World Surf League, 2024). Each judge assigns a score to the surfer's performance based on these criteria, and the scores are then averaged to determine the final score for each wave. Since surfing is not a time-based sport and the current evaluation method of surf performance in competitive surfers is only done by a panel of judges, assessing surf performance in recreational surfers can only be approached through limited methods. One commonly used approach is the subjective assessment by expert observers or coaches who evaluate the surfer's technique, style, and wave selection through video analysis which is a valid measure to observe key performance indicators in sport performance (Gomez-Ruano et al., 2020). This subjective assessment provides valuable insights into an individual's surfing abilities and can guide coaching and skill development. Another approach to assessing surf performance in recreational surfers is using wearable technology and quantitative measurements. Research completed by Gomes et al. (2019) explored the use of smartphones embedded on the surfer had microsensors to detect surfing events (paddling, wave-riding, etc.). Other studies have used

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sensors to evaluate internal and external loading of competitive surfers (FernAndez-Gamboa et al., 2018; Secomb et al., 2015). There are commercially available surf monitoring devices, such as the Rip Curl Search GPS watch and Apple Watch, that utilize Global Positioning System (GPS) signals to estimate and provide surf-related metrics, including wave count, distance traveled, and wave speed (Gomez-Ruano et al., 2020). Several mobile applications have been created such as Surf Track, Dawn Patrol, and Waves Tracker to collect the surfing metric data that can be analyzed to quantify and compare performance levels over a period of time. The application of wearable sensors to assess surf performance metrics offers objective assessment of a more precise and quantitative understanding of a surfer's abilities, allowing for tracking progress over time and facilitating targeted training interventions. Unfortunately, video analysis and wearable sensors are costly, and considering the dynamic and unpredictable nature of the surfing environment creates difficulty with measuring and quantifying performance metrics in real-time during surf sessions (Gomes et al., 2019; Mendez-Villanueva, Landaluce, et al., 2010).

Additionally, the reliance on technology for objective measurements may introduce limitations, such as potential measurement errors or constraints in data collection and analysis (Germini et al., 2022). The absence of universally accepted guidelines and the lack of standardization when assessing surf performance in recreational surfers makes it difficult to compare benchmark performances across different individuals or assess progression over time (Mendez-Villanueva, Mujika, et al., 2010). Hence, this introduces subjectivity and variability in the assessment process, as evaluators may have different interpretations and priorities when assessing surf performance. These limitations can impact assessments' accuracy, consistency, and comparability, requiring careful consideration and adaptation of assessment methods to evaluate surf performance in recreational surfers effectively.

Subjective questionnaires offer several advantages in assessing sport performance, providing valuable insights into an individual's subjective experiences, perceptions, and psychological factors related to their performance (Duignan et al., 2020). By allowing athletes to reflect on their experiences and provide subjective feedback, questionnaires can uncover nuanced information that may not be captured through objective measures alone. This comprehensive understanding of an athlete's subjective experience can aid in identifying areas of strengths and weaknesses and inform targeted interventions to optimize performance (Duignan et al., 2020; St-Cyr et al., 2021). Subjective questionnaires also facilitate standardized data collection and analysis, allowing for comparisons and identifying patterns or trends within a specific sport or population. Additionally, subjective questionnaires are cost-effective, efficient, and enable standardized data collection, making them valuable tools for assessing sport performance on a larger scale. Since the current evaluation of surf performance is only accomplished by observation from a panel of judges, assessing surf performance through a subjective questionnaire of recreational surfers can be valuable for this population. Therefore, the development of a valid questionnaire for recreational surfers is warranted. The purpose of this study is to establish face, content, and criterion validity of the subjective surfer's performance questionnaire (SPQ).

METHODS

Participants and Study Design

The study design consisted of three phases: face validity, content validity, and criterion validity. There were three sets of participants for this study. For face validity, the authors recruited five individuals with expertise in surfing performance (coaches, instructors, trainers, researchers). To assess the content validity, the authors recruited 23 individuals with expertise in surfing performance (coaches, instructors) via the Ebel method. The criterion validity was assessed from a surfing intervention study completed by Monaco et al (Monaco et al., 2023).

Face Validity

To begin the process of developing the SPQ, the authors devised seven basic surfing demands or elements that are very common with the sport of surfing (catching wave capability, pop up, paddling, wave riding quality, consistently of catching waves, maneuvering ability while wave riding, stamina in water) as described by Farley et al (Farley et al., 2017). The initial draft of the SPQ required surfers to rate their performance of the seven basic surfing elements on a 5-point rating scale (poor, fair, adequate, good, excellent). The author's performed a purposeful sampling by researching through published research articles on surfing and contacted the author's of those studies and contacted local (New Jersey, USA) surf instructors/coaches/trainers about analyzing the proposed questionnaire. This draft of the SPQ was then emailed to individuals with expertise in surfing performance (coaches, instructors, trainers, researchers) to provide face validity. The experts were asked to review the SPQ rate the importance of the seven categories and provide comments and feedback to help further develop the tool. As a result, there were five individuals with surfing expertise who provided feedback and were used to establish face validity of the initial surfer performance questionnaire. The demographics of the five surfing individual reviewers are located in Table 1.

During the face validation process, the reviewers provided feedback to the authors in establishing the surfing elements deemed applicable for surfing performance. The authors analyzed the feedback from reviewers and examined the agreement on the surfing elements presented on the SPQ as well as incorporating any feedback that would help further describing a demand and how to score the questionnaire. After this consultation, the final version of the SPQ was developed into an assessment consisting of five key elements of surfing: catching a wave, pop up, paddling, wave riding, and stamina in the water, each rated on a 9-point Likert scale (best possible score is 45). The consensus of the

Table 1. Demographics of Experts Used to Determine Face Validity of SPQ

Validator	Background	Years Experienced
1	Surf Researcher and Coach/Instructor	Researcher: 8 years Coach/Instructor: 6 years Active Surfer: 19 years
2	Surf Researcher and Surf Trainer	Researcher: 8 years Trainer: 10 years
3	Surf Coach/Instructor	Coach/Instructor: 10 years Active Surfer: 25 years
4	Surf Coach/Instructor	Coach/Instructor: 40 years Active Surfer: 53 years
5	Surf Trainer	Trainer: 3 years

initial reviewers felt that the categories of catching wave capability and consistency of catching waves as well as wave riding quality and maneuvering ability while wave riding were very similar and should be merged (catching a wave and wave riding). The reviewers also recommended criteria or anchors of the scoring in each of the categories to give the raters a more concise description of rating the surfing elements. Therefore, the authors utilized the feedback and implemented the descriptions in the SPQ. For example, to rate "Consistency of Catching a Wave", anchors such as "inability to catch wave on attempts in clean conditions" was used to rate a 1-3 score out of 9 while "ability to catch 50% of waves in clean conditions" was used to rate a 4-6 score out of 9. Further descriptions for the surfing elements were also added from the reviewers' recommendations (i.e. Wave riding quality: How would you generally rate your ability to consistently ride the wave. Examples would be: wiping out, executing turns, and maintain your surfers stance on a clean day). Due to the variability and unpredictable nature of the surfing environment, the authors determined that the SPQ will be more accurate when measuring in a controlled environment such as "clean" day. A definition of a "clean" day: wind is favorable (off-shore wind direction), surface conditions are clean (non-choppy, smooth), waves are average size (2-4 ft), and the sets are consistent with long, open-face rides with no close-outs. Thus, the instructions for using the SPQ have this written in the directions. See Figure 1 for the face validity development.

Content Validity

Second, we used the Ebel method to establish content validity. The Ebel method is a standard-setting approach commonly employed to establish cut scores for multiple-choice tests and has been utilized in setting examination standards within higher education, medical and health professions, as well as in applicant selection decision-making. (Bourque et al., 2020; Frey, 2018). The Ebel method involves a panel of experts who classify each item by two criteria: 1) level of difficulty (e.g., easy, medium, hard) for the subject to answer the question and 2) relevance or importance (e.g., essential, important, marginal) for content or activity (Bourque et al., 2020; Frey, 2018). Twenty-one individuals with surfing expertise (9 certified surf instructors/coaches, 8 non-certified surf instructors/coaches, and 3 surf performance trainers) used the Ebel method to evaluate the content validity of the SPQ. Then, we assessed if the panel reached a consensus regarding the expected percentage of answers for each item group, classified by difficulty and relevance/importance. The "50%" threshold is used to define what a minimally competent individual should be able to answer on a test, indicating that they should be able to answer a significant portion of "easy" and "medium" questions but only a small percentage of "hard" questions correctly (Cizek & Bunch, 2007). Our goal was to have >50% of each item rated as level of difficulty of easy or medium and relevance or importance as essential or important to be retained. Any items that scored ≤50% on the Ebel method would have been excluded from the SPQ. Demographics for the instructors and coaches are located in Table 2.

Criterion Validity

Lastly, the authors established criterion validity using data from a research study completed by Monaco et al. (Monaco et al., 2023) that examined the effects of a land-based home exercise program on surfing performance with recreational surfers. Twenty-two recreational surfers participated in the study and completed both the first version of SPQ and the Trait Sport-Confidence Inventory (TSCI) before and after the eight-week intervention (Monaco et al., 2023). The SPQ allowed participants to rate their own surf performance. The TSCI was used to assess the surfer's confidence when they compete or participate in their sport (surfing). The tool is based on comparing their self-confidence to the most self-confident athlete they know performing the sport. The TSCI is a validated instrument that measures an individual's confidence in performance at present (Vealey, 1986) (Manzo et al., 2001). The questionnaire consists of 13 questions rated on a 9-point Likert scale (total possible score: 117). The total score was the overall sum of the 13 questions. Due to the general language of the TSCI, the assistant investigators explained the general terminology in the questions with surfing terminology. For example, replace the term "competition" with "surfing session" since we were using recreational surfers. Therefore, we used the results TSCI as the gold standard and compared the results of the SPQ so that we could establish criterion validity.

Statistical Analysis

SPSS (IBM SPSS version 22.0, IBM Corporation, Armonk, New York) was used to analyze the data. When establishing content validity, descriptive statistics (frequency counts, %) were used for each of the five key elements of the SPQ. Any items that scored ≤50% on the Ebel method would have been excluded from the SPQ. Interclass Correlation (ICC- Choen's alpha and average measures) was used to evaluate the agreement between the expert panel raters for each of the five key elements. To establish criterion validity Pearson (r) was used to assess the correlation coefficient between the SPQ and the TSCI. All alpha levels were set

Rating item	Poor	Fair	Adequate	Good	Excellent
Catching wave capability					
Pop up					
Paddling					
Wave riding Quality					
Consistently of catching waves					
Maneuvering Ability					
Stamina in water					

a

The Surfer's Performance Questionnaire

The objective of SPQ is for a RECREATIONAL SURFER to rate their performance on key demands of surfing. Answer the following questions below based on how well you perform these physical demands of surfing. Please rate these demands on how you "generally" feel on your recent performance while surfing. Only rate on a "clean" day. A definition of a Clean day: Wind is favorable (off-shore wind direction), surface conditions are clean (non-choppy, smooth), waves are average size (2-4 ft), and the sets are consistent with long, open face rides with no close-outs.

On a clean day... How would you rate your:	Rating of physical demands of surfing								
Consistency of Catching a wave *How would you generally rate your ability to consistently catch a wave on a clean day*	1 Inability to catch wave on attempts in clean conditions.	2	3	4	5 Ability to catch 50% of waves in clean conditions.	6	7	8	9 Always caught wave clean conditions.
Pop up *How would you generally rate your ability to consistently perform a fluid pop-up on a clean day*	1 Inability to pop-up in clean conditions. Pop-up is non-fluid.	2	3	4	5 Ability to pop-up 50% of time in clean conditions. Pop-up is semi-fluid.	6	7	8	9 Always pop-up in clean conditions. Pop-up is fluid
Paddling *How would you generally rate your ability to paddle during a session on a clean day. Paddling includes: to the wave-break (Paddle Out) and paddling while scoping for a wave.*	1 Moderate difficulty to Wave break. Form is Non-fluid, always feels unbalance in clean conditions.	2	3	4	5 Mild difficulty to wave break. Form is semi-fluid, somewhat balanced in clean conditions.	6	7	8	9 No difficulty to wave break. Form is fluid, always feels balanced in clean conditions.
Wave riding Quality *How would you generally rate your ability to consistently ride the wave. Examples would be: wiping out, executing turns, and maintain your surfers stance on a clean day*	1 Inconsistent. Frequently wipes-out, inability to execute turns and cannot maintain surfers stance while riding the wave in clean conditions.	2	3	4	5 50% consistent. Occasionally wipes-out, executes turns and maintains surfers stance 50% of time while riding the wave in clean conditions.	6	7	8	9 Always consistent. Infrequently wipes-out, always executes turns and maintain surfers stance while riding the wave in clean conditions.
Stamina in water How would you generally rate your stamina (length of surf session) on a clean day.	1 I can't surf more than 45 minutes	2	3	4	5 I Can't surf more than 90 minutes	6	7	8	9 I can surf more than 2 hours

Total Score: _____

b

Figure 1. Face validity development in SPQ prior to (a) and after (b) the expert reviewers' responses.

at p <.05 a priori. The ICC operationally defined values less than 0.5, between 0.5 and 0.75, between 0.75 and 0.9, and greater than 0.90, as poor, moderate, good, and excellent reliability, respectively (Koo & Li, 2016). The Pearson r operationally defined values of 0.0-0.10, 0.10-0.39, 0.40-0.69, 0.70-0.89, and 0.90- 1.0 as indicative of negligible, weak, moderate, strong, and very strong correlation, respectively (Schober et al., 2018).

RESULTS

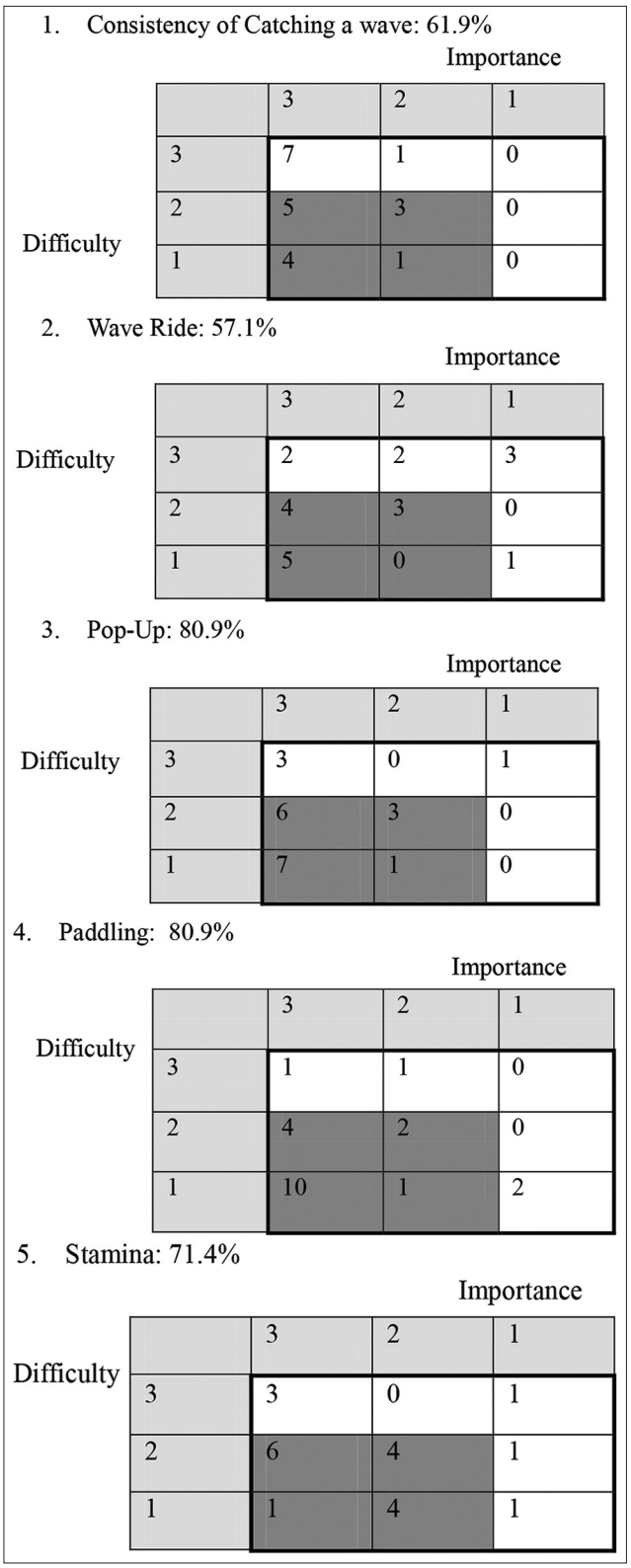
Face Validity

After the face validation process, the reviewers provided feedback to the authors in establishing the surfing elements deemed applicable for surfing performance which developed into the SPQ. After this consultation, the final version of the SPQ was developed into an assessment consisting of five key elements of surfing: catching a wave, pop up, paddling, wave riding, and stamina in the water, each rated on a 9-point likert scale (best possible score is 45). The authors then sought out surfing instructors/coach to establish content validity of SPQ.

Content Validity

All 5 key elements had greater than 50% agreement for Ebel results and were included on the final SPQ: catching a wave (61.9%), pop-up (80.9%), paddling (80.9%), wave riding (57.1%), and stamina in the water (71.4%). The overall

agreement of the raters on the SPQ was good (ICC=0.877, p=0.0001). The ICC for the SPQ individual elements demonstrated excellent agreement with catching the wave (ICC=.921, p=0.002) and paddling (ICC=.966, p=.001), good agreement with pop-up (ICC=0.857, p=0.016) and stamina in the water (ICC=0.804, p=0.035) but poor agreement with wave riding (ICC=-0.54, p=0.343).



	3	2	1
3	7	1	0
2	5	3	0
1	4	1	0

	3	2	1
3	2	2	3
2	4	3	0
1	5	0	1

	3	2	1
3	3	0	1
2	6	3	0
1	7	1	0

	3	2	1
3	1	1	0
2	4	2	0
1	10	1	2

	3	2	1
3	3	0	1
2	6	4	1
1	1	4	1

Figure 2. Contingency Tables of the Five Key Elements Included on the SPQ. The gray areas represents the acceptance area from the Ebel method. For importance: (3)-essential, (2)-important, (1)-marginal; and for difficulty: (3)-hard, (2)-medium, (1)-easy

Criterion Validity

The correlation between the SPQ and TSCI (pre score, post score, change of scores) was weak (r = 0.228; p=0.307), moderate (r = 0.440; p=0.04), very weak (r = 0.134; p=0.552) respectively. Figure 2 demonstrates the Ebel method table results and Figure 3 shows the (A) pre score (B) post score (C) correlation of change of scores. Table 3 provides the inter-rater agreement on scoring the relevance/importance and level of difficulty.

DISCUSSION

The purpose of this study was to establish face, content, and criterion validity of the SPQ. As a result, the overall agreement of the raters on the SPQ content validity was good while the criterion validity demonstrated a very weak to moderate correlation. These findings suggest the SPQ can be practical to evaluate a recreational surfer's performance. However, caution should be considered since there was a lack of agreement on the wave ride and the criterion reference could not be validated. Surfing has experienced a remarkable surge in popularity globally. This rise can be attributed to a confluence of factors, including increased accessibility to coastal areas, advancements in equipment technology, development of wave pools, and heightened visibility in mainstream media (Monaco et al., 2024). Additionally, innovations in surfboard and wetsuit designs have enhanced the overall experience, appealing to both beginners and seasoned surfers (Monaco et al., 2024). Due to the increased participation in this sport, methods are needed to evaluate the quality of a surfer in achieving the standard elements of surfing. Since there are limitations of assessing a surfer's performance, especially in recreational surfers who do not compete, the SPQ is a cost-effective assessment to measure a recreational surfer's performance in-water since it includes the primary elements of surfing. Thus, a tool such as the SPQ could be valuable for tracking a surfer's progression.

Table 2. Demographics of experts used to establish content validity of SPQ

Type	Number	Years Experienced	Certified
Surf Instructors/ Coaches	18	1-5 years: 6 6-10 years: 6 11+years: 6	Yes: 9 No: 8
Surf Trainers	3	6-10 years: 3	Yes: 3 (CSCS*, CCSP^)
Surf Researchers	2	6-10 years: 2	

*Certified Strength and Conditioning Coach. ^Certified Chiropractic Sports Physician

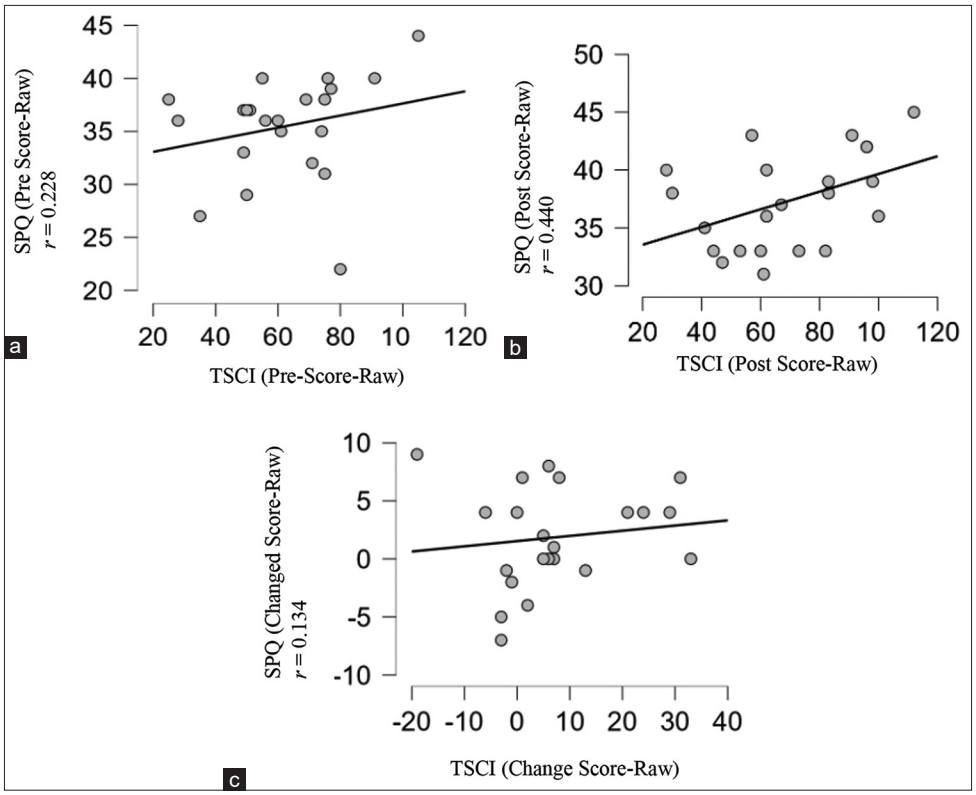


Figure 3. (a-c) Scatter plot of the correlation between the SPQ and TSCI

Table 3. Inter-rater agreement on scoring the relevance/ importance and level of difficulty

Results	ICC	P	Percent Agreement (EBEL)
Overall	0.877	0.0001	NA
Catching A Wave	0.921	0.002	61.9%
Pop Up	0.966	0.001	80.9%
Paddling	0.857	0.016	80.9%
Wave Riding	0-0.54	0.343	57.1%
Stamina In The Water	0.804	0.035	71.4%

Face Validity

The development of the questionnaire was structured based on the recommendations of the initial reviewers during the face validation. One of the key recommendations was expanding the questionnaire from 5-point Likert scale to 9-point Likert scale. Researchers argue that expanding the number of response categories can improve sensitivity and discrimination in measurement. Lozano et al. (2008) found that increasing the number of response options from two to nine led to higher Cronbach's alpha values, thereby enhancing reliability. The SPQ scoring scale expanded to capture a more effective result amongst the surfers. Another key recommendation from the initial reviewers was to incorporate anchors or an external indicator to assess the relationship between scores on the target instrument—whose interpretation is under review—and an independent measure (the anchor) (Guyatt et al., 2002). The anchors the questionnaire used were "inability to catch wave on attempts in clean conditions" was used to rate a 1-3 score out of 9 while "ability to catch 50% of waves in clean conditions" was used to rate a 4-6 score out of 9. This method can improve the reliability of the questionnaire because the selection of several types of anchors are useful for the rater or surfer to acknowledge the objectivity of how the surfing elements are executed (Zhang et al., 2023).

Content Validity

According to the Ebel results, the surfing elements of the pop-up and paddling had to highest agreement amongst raters. Paddling comprises 42-54% of total time with a surf session therefore it is a key element with surfing and a fundamental movement (Farley et al., 2017). Thus, most surf instructors and training coaches agree that this element greatly impacts surfing performance. The pop-up can be described as a dynamic, explosive upper-body movement resembling a plyometric push-up, combined with rapid flexion of the lower extremities to position them beneath the body, followed by a simultaneous landing onto the board. (Bruton et al., 2017; Eurich et al., 2010; Parsonage et al., 2017). Borgonovo-Santos et al. (2021) recognizes this phase is most challenging for recreational surfers, requiring a high level of dynamic strength, mobility, and neuromuscular control to execute successfully. However, without this fundamental movement, surfing cannot be performed. Hence, this element was highly accorded with our expert raters for its importance in contributing to an individual's surf performance.

There was poor agreement between the raters (surf coaches/instructors) on wave riding capability. Wave riding is the core of surfing; however, successfully executing this

highly advanced motor skill requires first mastering a series of complex tasks in a dynamic and unstable environment (Borgonovo-Santos et al. 2021). Most surf instructors and coaches prioritize the basic elements of surfing which are paddling, catching the wave, and pop-up as a criteria to be a successful surfer since these elements come before the wave ride. Therefore, wave riding might not be a focus for beginner and novice surfers. Although wave riding abilities are important for a surfer's performance, this category might be secondary to the basic elements described above.

Criterion Validity

When it came to evaluating the criterion validity of the tool, the TSCIs aim was to evaluate the confidence levels of the athlete or surfer (Manzo et al., 2001). The Monaco et al. (Monaco et al., 2023) study found the SPQ demonstrated a very weak to moderate positive correlation with the TSCI. Although there was a moderate correlation between the subjective questionnaires post-intervention, there was a large variance. Several of the questions on the TSCI focused on perceptions of the ability to execute sport-specific tasks and the notion of competitive orientation (Manzo et al., 2001). The SPQ only assessed physical elements of surfing but did not factor in any other attributes such as reading a wave and being in the best spot to catch the wave that may contribute to improving surfing performance (Paillard et al., 2011). The only other subjective surf performance rating scale that exist was the Hunt, Black, and Mead (Hutt et al., 2001) skill rating of a surfer. However, this rating scale only analyses the wave ride and does not capture any other foundational surfing elements but can aid further development of the SPQ, thus making it a challenge to set criterion validity at this point.

Subjective performance questionnaires, while valuable for capturing individual perspectives, possess inherent limitations. Their dependence on self-reporting introduces the risk of response bias, as participants may provide answers influenced by social desirability or personal perceptions, thereby affecting the accuracy of the data. (Tourangeau, 2021). Moreover, these questionnaires may lack objectivity and precision in measuring complex constructs, as individuals interpret and respond to items differently (Podsakoff et al., 2003). The challenge of recall bias further complicates the reliability of retrospective assessments, as participants may struggle to accurately recall past experiences or may be influenced by recent events (Stone et al., 1999). While subjective questionnaires offer valuable insights into psychological and experiential aspects, researchers must consider these inherent limitations when interpreting and generalizing findings in the context of sport and performance assessments.

Limitations

While we found the SPQ to be a valid tool for rating recreational surfer performance, this work is not without its limitations. Since the questionnaire's development only focused on a specific population of surfers (beginner to intermediate recreational surfers), it was unable to capture the ability and performance of elite or competitive surfers. This was due to the advanced physical and tactile demands of this group of surfers which included complicated maneuvering such as aerials and floaters which were not incorporated on the questionnaire. Elite or competitive surfers require advanced maneuvering in order to score more points in a competition and to be recognized by their sponsor (Ferrier et al., 2018). Since this group of surfers has inherited these foundational elements from repetitive and continuous practice of surfing (Paillard et al., 2011), the SPQ is not applicable and not sensitive enough to demonstrate improvements in their surfing performance.

PRACTICAL APPLICATION

Surfing occurs in the unpredictable and constantly changing environment of the ocean, where success is not measured by time or distance. (Monaco et al., 2024). Beginning and novice -level surfers can utilize the SPQ to assess their own performance and track their progression due to the variable environment. The SPQ has specific indicators for each surfing element which makes it feasible for the surfer to self-rate. Additionally, surf instructors and coaches should use the SPQ to assess the progression of a client's surf performance over a duration. Since there has been an increased interest in active individuals who want to pursue the sport, there will be an abundant request to learn and improve the surfing elements (Monaco et al., 2024). Hence, surf instructors and coaches can use the SPQ to assess the client's improvement as well as the quality of their instructional methods. Surfing places high physical demands on the body, requiring excellent cardiovascular fitness and muscular endurance, significant body strength, and anaerobic power, particularly in the upper torso (Farley et al., 2017). Strength and conditioning coaches can benefit from the SPQ by assessing the effects of a land-based conditioning program on the client's surf performance. This is a valuable instrument for strength and conditioning coaches to utilize to determine the effectiveness of their prescribed exercise program for surfing clients. A study that utilized the SPQ found that there was an improvement in the total SPQ score with a large effect size after the clients completed an 8-week surf-specific training program (Monaco et al., 2023). Therefore, the SPQ had an adequate amount of sensitivity and transferability to provide performance outcomes of a land-based conditioning program for an in-water sport.

The SPQ can evaluate a beginner to novice level of surfers, but further development is warranted. Future research should aim to assess the SPQ in different levels of surfers (IE: beginners vs advanced/elite), correlate with surf metrics (wave count, speed, time, and distance of wave riding) and other technology (video analysis) to acquire a comprehensive analysis on surfing performance, and develop a minimal clinically important differences that reflect significant changes in a clinical intervention that are meaningful for the client.

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The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

All authors have contributed to the article

1. Conception or design of the work. All Authors
2. Data collection. Monaco
3. Data analysis and interpretation. All Authors
4. Drafting the article. Monaco, Boergers
5. Critical revision of the article. Monaco, Boergers
6. Final approval of the version to be published. All Authors

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