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“Eddie would(n't) go!” perceptual-cognitive expertise in surfing

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ABSTRACT

Objectives: The goal of the present research was to investigate the decision making skills of surfers as a function of surfing experience.
Design: We used a between-subject quasi-experimental design.
Method: Participants ($N = 76$) with different levels of surfing expertise were asked to indicate via a button press which waves they would try to catch in a computer-based video decision-making task that presented videos of approaching waves.
Results: The quality of participants' decisions corresponded in a linear manner with the amount of surfing experience, i.e. the more experience a surfer had, the better they were able to decide which waves were surfable and which waves were not. Specifically, more experienced surfers were superior at deciding which waves not to surf.
Conclusions: We provided first evidence that highly experienced surfers possess a cognitive advantage compared to less experienced surfers or a non-surfing control group by being better able to distinguish between surfable and non surfable waves. The results are discussed within the expert performance approach as being supportive of the notion that surfing experience led to perceptual-cognitive adaptations that allow surfers to pick the right waves.

Eleven time world champion of surfing, Kelly Slater once said that “a big part of my success has been wave knowledge” (http://www.surfertoday.com/surfing/8267-the-best-surfing-quotes-of-all-time, retrieved on the 30.07.2014). Wave knowledge refers to the essential skill in surfing of “picking the right wave to surf on”. Just how important this cognitive skill is was highlighted in the world championship finale in December 2013 on the North shore of Oahu, Hawaii when Australian Mick Fanning managed to secure the world title over Kelly Slater. In both of his decisive heats, Fanning was close to losing and time was running out. In both heats Fanning waited patiently letting one wave after the other go by and only decided to go on a wave in the final minutes of the heat. Both times he received near perfect scores—that none other of the prior waves would have offered—enabling him to not only win the heats in the last minute, but more importantly to win the world title: “I just saw the set on the horizon, and I thought alright, whatever's going to come, I'm just going to try and pick the right one” (http://www.theguardian.com/sport/2013/dec/15/mick-fanning-wins-world-surfing-title-kelly-slater, retrieved on the 30.07.2014; quote from Fanning in the interview directly after winning). Although, this anecdotal example suggests an important role of “wave knowledge” and decision making in surfing, to date no empirical research has been conducted investigating the perceptual-cognitive skills underpinning surfing expertise. This is surprising considering the growing body of evidence highlighting the importance of perceptual-cognitive skills in sporting expertise (Mann, Williams, Ward, & Janelle, 2007; Williams & Ericsson, 2005; Williams & Ford, 2008; Yarrow, Brown, & Krakauer, 2009). According to Marteniuk (1976) a perceptual-cognitive skill can be defined as the ability to identify and acquire environmental information for integration with existing knowledge to facilitate the selection of an appropriate response to be executed. Given the missing research on perceptual-cognitive skills in surfing, the present study investigates decision making in surfing as to date only physical factors such as postural control (Chapman, Needham, Allison, Lay, & Edwards, 2008) or upper body strength and fitness (Mendez-Villanueva & Bishop, 2005; Mendez-Villanueva et al., 2005) have been shown to be important factors in elite surfing.

Perceptual-cognitive expertise in sports

The study of how athletes reach and stay at the pinnacle of their respective sports or what factors contribute to superior

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performance in sport has received a great deal of attention by sport expertise researchers (Starkes & Ericsson, 2003 for a review). On a very general level expertise can be defined as the ability of a person to consistently demonstrate superior levels of performance in a specific domain over an extended time period (Starkes, 1993). Knowledge of the factors that limit and contribute to superior sport performance are important for several reasons: (a) this knowledge provides a basis for deriving types of practice and training that are most efficient for performance enhancement (Ericsson, 2006); (ii) to predict who has the best chances of being successful in a particular sport (Williams & Reilly, 2000); (iii) on a theoretical level to test general theories of skill acquisition and expertise (Williams & Ericsson, 2005).

Athletes are required to adapt to specific constraints (Davids, Button, & Bennett, 2008) imposed by the sporting environment to perform successfully or circumvent potential performance decrements. Until fairly recently great athletes were considered an “assemblage of physical prowess” so researchers did not pay much attention to cognitive factors involved in expert sport performance (Starkes, Helsen, & Jack, 2001). Today most scientists acknowledge the important role of cognitive processes in sporting performance which has led to a substantial accumulation of literature (Ericsson, Charness, Feltovich, & Hoffman, 2006; Starkes & Ericsson, 2003; Williams & Hodges, 2004) which broadly states that expert sport performers gain an advantage by acquiring cognitive skills and strategies through deliberate practice that increase their efficiency of processing information (e.g. Eccles, 2006). While research on expertise has provided limited support that expert and less skilled performers differ on basic visual (e.g. acuity) or neural (e.g. memory) capacities (Furley & Memmert, 2010, 2011), there has been an accumulation of findings suggesting differences between these groups in terms of how information in the performance domain is processed (e.g. Eccles, 2006). Specifically, it has been suggested that experts attend, perceive, encode, store, and recall information in a qualitatively different way (e.g. Macquet, Eccles, & Barraux, 2012) which enables them to circumvent and extend their basic limits on information processing. By engaging in a large amount of deliberate practice (Ericsson, Krampe, & Tesch-Römer, 1993) expert performers increase their domain-specific knowledge and acquire adaptations to memory that allow for highly efficient encoding and retrieval while performing (Ericsson & Kintsch, 1995). For example, research in team- and racket sports has shown that expert athletes show a superior visual search behavior, utilize early cues in the performance environment more efficiently, detect meaningful patterns of information in the performance environment instead of processing every source of information individually, and are better able to predict situational probabilities which in turn lead to superior decision making skills (Williams & Ford, 2008). However, it is currently not clear whether these findings transfer to sports such as surfing as the constraints in surfing are considerably different from e.g. association football or tennis. A major difference is that performance in surfing is highly dependent on ecological factors such as wind, swell direction, swell period, tide, and surface conditions (Butt, 2014). Hence, the present research sought to extend previous work on expertise by investigating whether skilled surfers demonstrate perceptual-cognitive skills that allow them to read their respective performance environments more effectively which in turn results in superior decision making.

The present research

According to the expert performance approach (e.g. Williams & Ericsson, 2005) an essential first step in the systematic study of perceptual-cognitive sport expertise is to initially capture superior performance in a representative laboratory task in a reliable manner. Therefore, we created a laboratory task modeling the situation in which wave surfers have to decide on which waves to catch (i.e. which waves were surfable) and which ones not (i.e. which waves were not surfable) in a sample of video clips that resembled the first person perspective a surfer has of approaching waves.

Somewhat intriguingly, surfers only spend a small fraction of the time during a surfing contest or a recreational surfing session actually surfing (approximately 4%, Mendez-Villanueva, Bishop, & Hamer, 2006). The remaining time they spend with behaviors aimed at preparing to catch the “right” waves. This large proportion of time spent preparing for catching waves indicates how important cognitive factors such as deciding on where to position oneself or which waves to paddle for are in surfing. Therefore, it is important to initiate the scientific investigation of the perceptual-cognitive skills that mediate expertise in surfing.

As every wave is different depending on a whole range of complex factors (Butt, 2014) an important feat of successful surfing is to decide on which waves to surf. Typically surfers sit on their surfboard in the line-up (the location in the water where the waves break) looking towards the horizon at the approaching waves. In this situation surfers have to use visual cues such as “bumps” on the horizon, height and steepness of the approaching wave or how the light is refracted from the water to anticipate whether this is a good wave to surf on (cf. Fig. 1). To the untrained eye most waves at a particular location look highly similar. However, experienced surfers seem to know which waves offer the greatest potential for surfing on, probably based on the vast amount of deliberate practice (Ericsson et al., 1993) activities they have invested in their respective performance environment. But whether this observation can be transferred to a laboratory setting in a quantifiable manner is yet to be elucidated. Following the expert performance approach (Williams & Ericsson, 2005) which necessitates “to design representative tasks that allow component skills to be faithfully reproduced in the laboratory” (p. 285), we created video stimuli resembling the perspective a surfer has when waiting for waves (cf. Fig. 1) and asked surfers to decide which waves they would try to catch and which ones not. The term representative design refers to the arrangement of the experimental conditions with the intention to represent the behavioral settings to which the results are intended to apply (e.g. Araujo, Davids, & Passos, 2007; Brunswik, 1956). We hypothesized that the more domain-specific experience surfers had, the more domain-specific knowledge they would have acquired, allowing them to discriminate between surfable and not surfable waves more effectively.

Fig. 1. Frozen frame from an experimental stimuli used in the study.