Upper body electromyographic analysis of the cycle stroke in stand-up paddleboarding

ABSTRACT

This study aimed to analyze the muscle activity during the stand-up paddleboarding (SUP) stroke, left and right sides of the body, as well as between adjacent and opposite muscles in relation to the paddle side stroke. Fourteen male paddleboarders aged 24.1 ± 7.1 years performed three trials covering a total distance of 180 meters at an individual pace, while surface electromyography (EMG) of the upper body muscles, Upper Trapezius (UT) and Biceps Brachialis (BB) were recorded (four paddle strokes on each side), divided into pull and recovery phases, according to the position of the blade in the water. The results showed that, during right-side paddling, a higher muscular activation regarding the % maximum voluntary contraction (MVC) was found on the opposite side for UT (24.35%MVC, p< 0.01) during the pull phase of the stroke, and for the opposite side for UT (14.78%MVC, p< 0.05) and adjacent BB (8.36%MVC, p< 0.03) during the recovery phase. During left-side paddling, a higher %MVC was found in the opposite UT (27.60%MVC, p< 0.01) and adjacent BB (9.24%MVC, p< 0.05) during the pull phase. Furthermore, the pull phase exhibited a higher %MVC on the opposite side of the UT compared to the recovery phase in both right-side (24.35%MVC, p< 0.03) and left-side (27.60%MVC, p< 0.01) paddling. The results showed that the muscles have been activated and that their activity can be allocated to the different phases of the stroke. The study proved that there is a lower level of muscle activity on the paddling side, while on the opposite paddling side, the activity is higher.

BACKGROUND

Stand-up paddleboarding (SUP) which combines elements of surfing and rowing, has emerged as a widely accessible and popular activity. Studies demonstrate a range of benefits, including improvements in body mass index, aerobic fitness, trunk strength, and applicability in rehabilitation and fall prevention (Schram et al., 2017a; Castañeda-Babarro et al., 2022; Ruess et al., 2013b; Schram et al., 2016b).

The paddling mechanics in SUP resemble dragon boat racing, encompassing phases of entry, drive, and exit (Ho et al., 2009). Research indicates that muscular activation during paddling primarily involves the upper limbs, trunk, hip stabilizers, and knees, with notable differences between experienced and inexperienced paddlers (Ruess et al., 2013a; Tsai et al., 2020; Schram et al., 2019).

Research into SUP has resulted in a very limited number of insights into the behavior of muscles during paddling on both sides.

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METHODS

Participants

.14 SUP practitioners, 24.1 ± 7.1 years ;

.Minimum experience of 6 months.

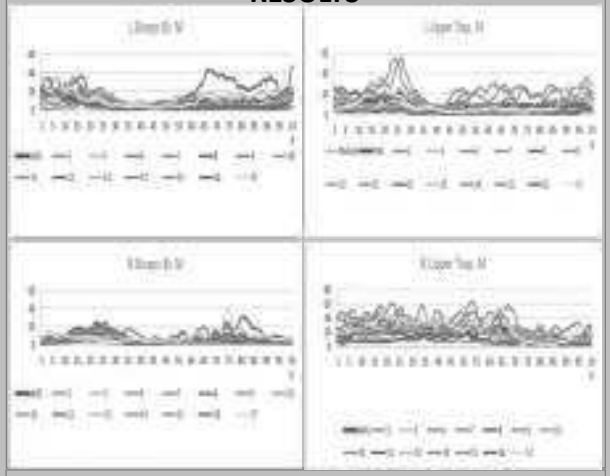
Testing

.A total distance of 180 meters (individual pace);

.Prior to the paddle assessment, was determined maximum voluntary contraction (MVC) in each subject;

.Surface electromyography (EMG) of the upper body muscles, Upper Trapezius (UT) and Biceps Brachialis (BB) were recorded (4 paddle strokes on each side), in pull and recovery phases.

RESULTS



.During right-side paddling, a higher muscular activation regarding the % maximum MVC was found on the opposite side for UT (24.35%MVC, p< 0.01) during the pull phase of the stroke, and for the opposite side for UT (14.78%MVC, p< 0.05) and adjacent BB (8.36%MVC, p< 0.03) during the recovery phase.

.During left side paddling, a higher %MVC was found in the opposite UT (27.60%MVC, p< 0.01) and adjacent BB (9.24%MVC, p< 0.05) during the pull phase.

.The pull phase exhibited a higher %MVC on the opposite side of the UT compared to the recovery phase in both right-side (24.35%MVC, p< 0.03) and left side (27.60%MVC, p< 0.01) paddling.

CONCLUSIONS

The results showed that the muscles Upper Trapezius and Biceps Brachialis have been activated and that their activity can be allocated to the distinct phases (pull and recovery) of the stroke.

The study proved that there is a lower level of muscle activity of Upper Trapezius and Biceps Brachialis on the paddling side, while on the opposite paddling side, the activity is higher.

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