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Surface electromyographic analysis of the biceps brachii muscle of cricket bowlers during bowling

Abstract

Cricket bowling generates forces with torques on the upper limb muscles and makes the biceps brachii (BB) muscle vulnerable to overuse injury. The aim of this study was to investigate whether there are differences in the amplitude of the EMG signal of the BB muscle during fast and spin delivery, during the seven phases of both types of bowling and the kinesiological interpretation of the bowling arm for muscle contraction mechanisms during bowling. A group of 16 male amateur bowlers participated in this study, among them 8 fast bowlers (FB) and 8 spin bowlers (SB). The root mean square (EMG_{RMS}), the average sEMG (EMG_{AVG}), the maximum peak amplitude (EMG_{peak}), and the variability of the signal were calculated using the coefficient of variance (EMG_{CV}) from the BB muscle of each bowler (FB and SB) during each bowling phase. The results demonstrate that, (i) the BB muscle is more active during FB than during SB, (ii) the point of ball release and follow-through generated higher signals than the other five movements during both bowling categories, (iii) the BB muscle variability is higher during SB compared with FB, (iv) four statistically significant differences ($p < 0.05$) found between the bowling phases in fast bowling and three in spin bowling, and (v) several arm mechanics occurred for muscle contraction. There are possible clinical significances from the outcomes; like, recurring dynamic contractions on BB muscle can facilitate to clarify the maximum occurrence of shoulder pain as well as biceps tendonitis those are medically observed in professional cricket bowlers, and treatment methods with specific injury prevention programmes should focus on the different bowling phases with the maximum muscle effect. Finally, these considerations will be of particular importance in assessing different physical therapy on bowler's muscle which can improve the ball delivery performance and stability of cricket bowlers.

Keywords; Cricket bowling, Fast and spin bowling, Surface electromyography, Biceps brachii