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BASIC STUDY

Physiological responses to karate specific activities



Les réponses physiologiques aux activités spécifiques de karaté

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Summary

Objectives. – The aim of this critical review was to discuss performance analysis characteristics and particular physiological demands related to karate *kata* and *kumite*.

News. – The intermittent nature of karate has been revealed via *kumite*'s time-motion analysis, with a 1:1.5 effort-pause ratio during official competition. Karate combat is mainly dependent on the aerobic metabolism. However, decisive actions' energy is provided by the anaerobic system. Concerning *kata*, it seems that the fraction of the energy supply is mainly a function of *kata*'s duration. The high-energy phosphate seems to be the major contributors while the aerobic energy system' participation rises with the increased *kata*'s duration.

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MOTS CLÉS

Karaté *kata* ;
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Réponses
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Analyse du
mouvement du temps

Prospects and projects. – Future investigations in an ecologically valid environment are needed to support the findings presented in the current review.

Conclusion. – Irrespective of karate's discipline, the aerobic system represents the main energy system, especially in longer *kata*. *Kumite* appears to demand much higher metabolic power than *kata*, regardless of gender, while *kata* appears to require more ATP-PCr energy system contribution than *kumite*.

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Résumé

Objectif. – Cette étude est une synthèse critique de la littérature concernant l'analyse de la performance en karaté et les réponses physiologiques suite au karaté *kata* et *kumité*.

Actualités. – Les travaux traitant l'analyse des combats officiels ont montré que le karaté est un sport à caractère intermittent avec un rapport effort/récupération de 1:1.5. Le système oxydatif domine la synthèse énergétique durant le combat avec intervention de la filière anaérobie au cours des actions décisives. En ce qui concerne le *kata*, la fraction d'intervention des filières énergétiques est tributaire de la durée du *kata*. En effet, la part d'intervention du système des phosphagènes (ATP-PCr) prédomine avec une intervention de plus en plus importante de la filière aérobie qui va de paire avec l'augmentation de la durée du *kata*.

Perspectives et projets. – Des études futures dans des conditions officielles de compétition (*kata* et/ou *kumité*) semblent être nécessaires pour confirmer les résultats actuels de la présente revue.

Conclusion. – Indépendamment de la spécialité (*kata* ou *kumité*), la filière aérobie semble être le premier responsable de la synthèse énergétique, particulièrement durant les *kata* de longue durée. La puissance métabolique durant le *kumité* semble être plus prononcée par rapport au *kata* indépendamment du sexe tandis que l'intervention du système ATP-PCr paraît être plus importante durant le *kata* par comparaison au *kumité*.

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1. Introduction

Karate contains two main practices (i.e., *kata* and *kumite*) [1]. *Kata* represents a pre-arranged form of demonstrating methods of attack, defense, and counter attack [2]. It is defined as a performance of set sequences of basic techniques (i.e., stances, hand punches and leg kicks and strikes) in a fight with an imaginary opponent [3]. Currently, *kata* competition takes either the form of team (three person per-team exclusively males, or exclusively females), and individual competition [1]. Karatekas have a time-range from 60-s to 80-s to finish the *kata* [1].

Kumite represents the process of sparring utilizing karate skills (i.e., punching and kicking techniques) performed by two opponents [4]. *Kumite* requires, from the karateka, a rapid programming of the adequate action responses to the process of defense and/or attack [5]. During *kumite*, punching (*tsuki*) and kicking (*geri*) techniques are allowed at the head (*jodan*) and abdomen (*chudan*). *Kumite* competition is divided into team matches and individual matches. Individual match is divided into age and weight categories [1]. Nowadays, *kumite* lasts three minutes for senior male (both teams and individuals) during eliminatory matches and four minutes in the individual bouts for medals. In regards to senior female, bouts are two minutes during eliminatory matches and three minutes in the individual bouts for medals [1].

Previously, athletes took part in both *kata* and *kumite* competitions. Currently, specialization of elite karate

competitors for *kata* and *kumite* has become more prominent. *Kumite* scoring system involves: 3 points (*Ippon*) are awarded for leg kicks to the head and the techniques of cleaning and throwing, which result in a final fall of the opponent or a final punch, 2 points (*Waza-Ari*) are adjudicated for kicks to the trunk and punches to the back, including the back of the head and neck. Finally, 1 point (*Yuko*) is awarded for single arm punches to the head and body [1]. It should be noted that the new rules are stricter about prohibited behaviors, including excessive contact when attacking permitted areas and particularly the head [1]. Otherwise, punches and kicks must be controlled (without injury to the opponent) or stopped before contact with the opponent's body. All these changes had made the *kumite* competitions more attractive, explosive, spectacular, and dynamic [4]. Unlike the *kumite*, the *kata* competition has not been evolved and modified so much since the basic requirements remained virtually unchanged. All the above cited reasons show the quite big difference between these two karate's disciplines. According to Arriaza [6], each modality (i.e., *kata* or *kumite*) requires specific extensive and intensive training stimulus, then karate practitioners tend to focus early on their training to one of these.

Performance analysis is one of the basic elements for developing sport-specific training and/or proper conditioning programs. Additionally, the identification of the physiological demand is one of the most important factors in improving performance and achieving the best results in all kind of sport (including karate). Thus, recognizing

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