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BRIEF NOTE

Effects of Ramadan fasting on repeated sprint ability in young children

Effets du Ramadan sur la capacité à répéter des sprints chez des enfants

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Summary

Aim. – To investigate the impact of intermittent Ramadan fasting on the ability of children to perform repeated sprints.

Methods and results. – Eighteen children performed 6 × 15 m sprints (15 s rest) before, during (1st and 4th week) and after (2 and 4 weeks) Ramadan. Compared to baseline, total sprint times lengthened 4 weeks into Ramadan and remained elevated 2 weeks post-Ramadan. Initial sprint performance and sprint decrement score did not change.

Conclusions. – Repeated sprinting performance was compromised towards the end of the Ramadan month in children and this effect persisted for 2 weeks, while fatigue resistance was not affected.

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Résumé

Objectifs. – Étudier l'impact du Ramadan sur la capacité à répéter des sprints chez des enfants.

Synthèse des faits. – Dix-huit enfants ont réalisé six sprints de 15 m (15 s de repos) avant, pendant (première et quatrième semaine) et après (deuxième et quatrième semaine) le Ramadan. Comparativement à la situation contrôle, les temps cumulés étaient plus longs lors de la quatrième semaine du Ramadan et deux semaines après la fin du Ramadan. Le temps lors d'un sprint unique et le pourcentage de diminution de performance étaient inchangés.

Conclusions. – La performance lors de sprints répétés était détériorée à la fin du Ramadan chez des enfants et cet effet persistait au moins deux semaines alors que la résistance à la fatigue était préservée.

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1. Introduction

Ramadan is a 4-week period in which healthy Muslims abstain from all types of liquid and solid nutrient intake from sunrise to sunset. Although Ramadan fast is not compulsory for young children, many practice it from early adolescence. Children are mostly engaged in multiple-sprint sports (soccer, basketball, tennis), which rely on the capacity to recover and reproduce performance in subsequent sprints; i.e. repeated sprint ability (RSA) [1]. Unfortunately most of the available literature related to aspects of Ramadan fasting on sporting performance is primary focused on adult Muslims [3]. When nineteen adolescent (14 to 16 years) football players were tested before and 4 weeks into Ramadan, RSA decreased (longer cumulated 6 × 40 m run times and larger performance decrement) at the end of the Ramadan fast, while 40 m sprint time was unaffected [4]. In this study, however, the well-trained nature of the participants, members of a first division team in the Israeli youth league, should be acknowledged, which may have complicated the interpretation of the independent effects of Ramadan fasting on RSA. Moreover, in the absence of acute and post-Ramadan measurements in this study, it is still unknown whether the diurnal nutrition and sleep cycle alterations imposed by Ramadan could lead to transient performance adaptations and/or persisting effects [3]. The aim of this study was to investigate the impact of the intermittent Ramadan fast on the ability of moderately active children to perform repeated sprints.

2. Methods

Eighteen young, non-athlete boys (age: 12.6 ± 1.5 years; stature: 156 ± 13 cm; mass: 45.3 ± 12.4 kg) from South East Asia were recruited during Ramadan 2010. The ASPETAR research committee approved the project and written informed consent was obtained from subjects and their parents. Subjects were tested on five occasions at the same time of the day (between 1 and 2 pm): 1 week before Ramadan (BR), during the 1st (R1) and 4th (R4) weeks of Ramadan as well as 2 (AR2) and 4 (AR4) weeks post-Ramadan. On each occasion, they performed a repeated sprint test on an indoor synthetic multiple-sport track consisting of six maximal 15 m straight-line sprints in alternating directions interspersed with 15 s of passive recovery. Subjects were instructed to complete all sprints as fast as possible (short sprint distance of 15 m was chosen to avoid pacing strategies), and strong verbal encouragement was provided to each subject during all sprints. Sprint times were recorded using photoelectric cells set with an accuracy of 0.01 s (Microgate, Bolzana, Italy). Over the six sprint bouts, best time in a single trial (initial sprint time) and the sum of all repetitions (cumulated sprint times) were determined. To assess fatigue during the RSA protocol, the sprint decrement score was calculated as follows: $[(\text{cumulated sprint times}/\text{initial sprint time} \times 6) - 1] \times 100$ [1]. Body composition which includes body fat percentage, lean mass and fat mass was assessed using dual energy X-ray absorptiometry (DEXA) scanning (GE Medical System Lunar, Madison, Wisconsin, USA). Objective measure of daily activity was monitored

using chest-worn 3-axis accelerometer (Alive Technologies Pty Ltd, Australia), worn during a 2-day period, providing an estimate of energy expenditure. Repeated measures Anova with two within level factors (Time period [BR, R1, R4, AR2 and AR4] × Sprint number [1 to 6]) were applied to study individual sprint durations. Repeated sprint ability, body composition and energy expenditure were studied using linear mixed-models statistical analysis approach using SPSS (v19.0, Chicago, Illinois).

3. Results

There was a significant main effect of sprint number ($P < 0.001$) and time period ($P = 0.05$) on sprint times but there was no interaction effect (Fig. 1). The cumulated sprint times differed ($P < 0.05$) across time period. Compared with BR, cumulated sprint times lengthened during Ramadan (R1: $P = 0.15$ and R4: $P < 0.05$) and remained elevated post-Ramadan (AR2: $P < 0.05$ and AR4: $P = 0.07$) (Table 1). Initial sprint performance and sprint decrement score did not change ($P < 0.05$) throughout the study. Body weight, but not body fat, lean mass and fat mass were elevated ($P < 0.05$) at R4 and AR2 vs. BR, whereas energy expenditure remained constant (Table 1).

4. Discussion

There is limited data investigating the effects of Ramadan on RSA. In line with our results, well-preserved unique sprint performance has been documented in Muslim soccer players observing Ramadan [2,4]. In a group of moderately active young boys our results showed impaired RSA, as evidenced by longer cumulated sprint times towards the end and 2 weeks post-Ramadan, whereas daily energy expenditure did not change. However, fatigue resistance indices did not change across the protocol, which differ from previous reports [2,4]. Nevertheless, difference in subject characteristics (age, training status), nature of the repeated sprint test (sprint number/duration, recovery time) or timing of tests (Ramadan period, time of day) are known to affect physical performance – i.e. task-dependency of the Ramadan effects – and therefore lead to only anecdotal comparisons of RSA responses between studies.

Exercise physiologists agree that muscle factors including substrate depletion, metabolite accumulation, ionic disturbances are key performance determinants during repeated sprint exercise, while more recently the modulation of motor unit activity has also been invoked [1]. Although the precise underlying mechanisms of this impairment in RSA cannot be identified in this sample of non-athletes, youth Muslims observing Ramadan, it is generally assumed that the negative effects of dehydration, the daily refraining from food consumption and the modification of the sleep-wake cycle account for impairment in physical performance during Ramadan [3]. Interestingly, deficiency of carbohydrate intake, and consequently lower muscle glycogen stores during test sessions, might have been associated with a decreased RSA [1]. Although glycogen availability was not assessed in this study, it should be noted that Ramadan is a phase shift in food intake more than a fast where food

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