Does Child have Muscle Pain after Enormous Exercise?

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Abstract

There are many researches of the effects of strenuous exercise on DOMS for adults have been presented. However, there are not many studies on children who have a lot of physical activity on a daily basis and are engaged in sports activities. In recent years, due to the younger age of sports competitions, practice specialized in specialized sports has been practiced since childhood. The practice in the children is similar to that of an adult, and there is a high opportunity that injury may occur. Therefore, the purpose of this study was to understand the effects of children after strenuous exercise on their bodies so that they can practice safely. Adults express DOMS regardless of gender in resistance training with eccentric muscle activity. However, even if boys and girls under the age of 15 in the developing stage perform resistance training with the same load, visual analog scale (VAS), which is an indirect index of DOMS, increases, but creatine kinase activity (CK), which is an index of muscle damage, does not increase. In addition, in uphill or downhill running due to its own weight, an increase in CK is observed in boys with high muscle mass, but not in girls with low muscle mass. Therefore, it was suggested that there may be a gender difference in the expression of DOMS that is not observed in adults, and a gender difference in the expression of DOMS in developing children.

Introduction

Delayed onset muscle soreness (DOMS) is called muscle soreness caused by unfamiliar exercise or high-intensity and intense exercise [1]. In addition, it has been presented that eccentric muscle activity causes DOMS [2], and Hiruma et al. [3] present that DOMS is not expressed by resistance training with 50% of one repetition maximum (1RM) and slow eccentric muscle activity. DOMS is accompanied by muscle damage [4], pain, muscle weakness, decreased range of motion, edema, increased activity of creatine kinase activity (CK) and glutamine [5]. These physical damages may cause various symptoms of injuries. These symptoms are used as indirect indicators of DOMS. It has been presented that the peak of pain is 24-48 hours, the peak of CK is 48-72 hours later, and almost all symptoms disappear after 7 days [6].

Physical activity in children is important for promoting healthy growth and development, developing healthy habits, and improving sports performance. A safe and effective exercise program is important for children to practice exercise habitually. Since DOMS is accompanied by pain and edema, muscle fiber damage [7], fascia damage [8], and Z-band damage [4,9] have been presented. From this, it is important for children in the developing stage to understand the effects on muscles after physical activity and sports, and [2] the recovery status of DOMS and muscle damage. It is important to prevent the occurrence of adverse events.

Therefore, the purpose of this study was to review the studies related to the keywords "DOMS" and 'children' and to examine them from the viewpoint of sex and exercise method.

Method

10 original papers submitted to overseas specialized journals, PUBLMED and CiNii, were extracted from 1989 to 2018. Table shows the subjects, loading methods, measurement items, and results of the five original papers extracted. These will be considered separately for sex and loading method.
with relatively low muscle mass compared to adults have less muscle damage. The significant increased CK and decreased IMS (p<0.05), even when resistance training is performed with the same load as male adults. It is probable that it was not recognized. Furthermore, it is considered that the rate of change in ROM and VAS was significantly lower than that in male adults because of less muscle damage.

**Downhill running and DOMS**

Webber et al. [12] compared the effects of downhill running on VAS and CK between boys and male adults and girls and male adults. VAS was significantly increased in all four groups after downhill running. There was also no significant increase in CK for girls and male adults. However, a significant increase in CK was observed in boys and male adults (p<0.05), but the rate of change was significantly higher in male adults (p<0.05). Again, as discussed in the resistance training and DOMS above, male adults are relatively heavier and stronger than boys, resulting in greater fall speed and greater muscle damage during downhill running. This is the reason for this muscle damage. The boys also tended to recover DOMS faster because of less muscle damage.

**Flatland running and DOMS**

Elamaran et al. [13] compared the effects of treadmill running with Brunce protocol (uphill running with increasing running speed) on CK for 14- and 16-year-old soccer players and boys of the same age. As a result, CK after treadmill running was significantly increased in four groups (p<0.05). The rate of increase was also significantly higher in boys of the same age than in soccer players aged 14 and 16 (p<0.05). Hiruma et al. [14] presented that repeated high-intensity training with muscle damage for 7 consecutive days under the same load resulted in muscle adaptation and recovery of DOMS indicators after the 4th day. Therefore, it is probable that both soccer players practice on a daily basis had a lower increase in CK than the boys of the same age due to the muscle adaptation to DOMS.

**Soccer match and DOMS**

Hughes et al. [15] compared the effects of female soccer players under the age of 13 (U13), under the age of 15 (U15), and under the age of 17 (U17) on CK and VAS, which are indicators of DOMS after the official match. As a result, a significant increase in CK and VAS was observed after the official match in all three groups (p<0.05). The increase in CK in U13 group also was more significant than in the U15 and U17 groups (p<0.05). However, VAS in U17 group showed significantly higher values than that in U13 and U15 groups (p<0.05). Due to daily training on the 3.5th and 5th days after the match, VAS and CK in the three groups did not recover to rest values on the 7th day. U13 and U15 groups had VAS immediately after the official match and on the 3.5th day. Despite showing the same value and lower than U17, CK value in U13 group was higher than that in U15 and U17 groups. In these three previous studies, boys and girls did not significantly increase in CK. It might be considered that the increase in the CK value of U13 group was due to contact or bruising in the match. CK presents intracellular changes. It leaked into the blood due to damage to the cell tissue and myocardium due to causes other than exercise.

**Conclusion**

It was suggested that there may be a gender difference in the expression of DOMS that is not observed in adults, and a gender difference in the expression of DOMS in developing children. However, there are very few studies on children compared to studies on adults. Therefore, further research is needed to protect children from muscle injuries and injuries and to create an environment where they can safely engage in sports and physical activity.

**Competing Interests**

The author declare that there is no competing interests regarding the publication of this article.
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