Resultado de investigación

Efectos de dos tipos de entrenamiento en fuerza sobre la composición corporal, la activación neuromuscular y las variables cinéticas y cinemáticas

Effects of two types of strength training on body composition, neuromuscular activation, and kinetic and kinematic variables

Efeitos de dois tipos de treinamento de força sobre a composição corporal, a ativação neuromuscular e as variáveis cinéticas e cinemáticas

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Resumen

El avance en el conocimiento de los aspectos mecánicos, fisiológicos, bioquímicos y neuromusculares subyacentes a los diferentes estímulos del entrenamiento de fuerza ha transformado nuestra comprensión de este paradigma en las últimas décadas. El propósito de este estudio es investigar los efectos de dos tipos de entrenamiento de resistencia (RT, *resistance training*). Uno se basa en la velocidad de desplazamiento de la carga (VBT, *velocity-based training*) y el otro se basa en el porcentaje de entrenamiento (PBT, *percentage-based training*) realizado al 70-80 % 1RM (*1 repetition máximum).* Se tienen en cuenta la masa muscular (MM, *muscle mass*), la densidad mineral ósea (BMD, *bone mineral density*), el componente mineral óseo (BMC, *bone*

mineral component), la activación neuromuscular (EMG, *surface electromyograms*), fuerza máxima en sentadilla (FSQ, *front squat*), el salto vertical (VJ, *vertical jump*), la potencia de pedaleo (PP, *paddling power*) y la velocidad de desplazamiento sobre 30 m (RV30, *running velocity over 30 meters*). Treinta y una mujeres se distribuyeron aleatoriamente en los grupos VBT (n=16) o PBT (n=15). Los grupos entrenaron tres veces por semana durante 12 semanas. Antes y después del entrenamiento se determinaron los valores de FSQ, VJ, PP, RV30, BMD, BMC, MM y EMG. El grupo VBT entrenó a una velocidad media propulsiva (VMP, *mean propulsive velocity*) de 0,68 ± 0,08 m s - 1 y el grupo PBT entrenó al 70-80 % 1RM. El RT produjo aumentos significativos ($p<0,05$) en los dos grupos en FSQ (VBT 33,79 %, PBT 27,94 %), VJ (VBT 19,11 %, 8,77 % PBT), RV30 (VBT 6,27 %, PBT 1,66 %), PP (VBT 32,2 %, PBT 16,11 %), MM sin grasa (VBT 3,7 %, PBT 2,64 %) BMC (VBT 0,39 %, PBT 0,25 %) y en BMD (VBT 0,76 %, PBT 0,80 %). No se observaron variaciones significativas en la actividad EMG en ninguno de los grupos. Se identificaron diferencias significativas entre los dos grupos de entrenamiento en BMD, PP, BMC y RV30. En conclusión, el entrenamiento VBT puede proporcionar un estímulo superior para inducir adaptaciones neuromusculares que generan mayores mejoras en salto vertical, velocidad sobre 30 m, potencia de pedaleo, densidad ósea mineral y aumentos similares o incluso mayores en la fuerza máxima en sentadilla, masa muscular y componente óseo mineral que en el entrenamiento basado en porcentaje. Además, el entrenamiento basado en velocidad mostró ligeros aumentos en la actividad de electromiogramas de superficie.

Palabras clave: activación neuromuscular, fuerza máxima en sentadilla, masa muscular, salto vertical, entrenamiento de resistencia, velocidad de desplazamiento de la carga.

Abstract

Advances in our knowledge of the mechanical, physiological, biochemical and neuromuscular aspects underlying the different stimuli of strength training have transformed our understanding of this paradigm in recent decades. The purpose of this

study is to examine the effects of two types of resistance training (RT). One is based on velocity-based training (VBT) and the other is based on percentage-based training (PBT) performed at 70-80% of 1RM (1 repetition maximum). Muscle mass (MM), bone mineral density (BMD), bone mineral component (BMC), surface electromyograms (EMG), maximum front squat strength (FSQ), vertical jump (VJ), paddling power (PP), and running speed over 30 m (RV30) are included. Thirty-one women were randomized to VBT (n=16) or PBT (n=15). The groups exercised three times per week for 12 weeks. FSQ, VJ, PP, RV30, BMD, BMC, MM, and EMG were measured before and after exercise. The VBT group trained at a mean propulsive velocity (MPV) of 0.68 ±0.08 m s - 1 and the PBT group trained at 70-80% 1RM. RT resulted in significant increases ($p<0.05$) in both groups for FSQ (VBT 33.79%, PBT 27.94%), VJ (VBT 19.11%, PBT 8.77%), RV30 (VBT 6. 27%, PBT 1. 66%), PP (VBT 32.2%, PBT 16.11%), fat-free MM (VBT 3.7%, PBT 2.64%), BMC (VBT 0.39%, PBT 0.25%), and BMD (VBT 0.76%, PBT 0.80%). No significant changes in EMG activity were observed in either group. Significant differences between the two exercise groups were observed in BMD, PP, BMC, and RV30. In conclusion, VBT training may provide a superior stimulus to induce neuromuscular adaptations that produce greater improvements in vertical jump, running velocity over 30 m, paddling force, bone mineral density, and similar or even greater increases in maximal squat strength, muscle mass, and bone mineral component than percentage-based training. In addition, velocity-based training showed small increases in surface electromyogram activity.

Keywords: neuromuscular activation, maximum squat strength, muscle mass, vertical jump, resistance training, load displacement velocity.

Resumo

Os avanços no conhecimento dos aspectos mecânicos, fisiológicos, bioquímicos e neuromusculares subjacentes aos diferentes estímulos do treinamento de força transformaram nossa compreensão desse paradigma nas últimas décadas. O objetivo deste estudo é examinar os efeitos de dois tipos de treinamento de resistência (RT,

resistance training). Um deles baseia-se na velocidade em que a carga é movimentada (VBT, *velocity-based training*) e o outro na porcentagem de treinamento (PBT, *percentage-based training*) realizado entre 70-80 % de 1RM. São levados em conta a massa muscular (MM, *muscle mass*), a densidade mineral óssea (BMD, *bone mineral density*), o componente mineral ósseo (BMC, *bone mineral component*), a ativação neuromuscular (EMG, *surface electromyograms*), a força máxima de agachamento frontal (FSQ, *front squat*), o salto vertical (VJ, *vertical jump*), a potência de remada (PP, *paddling power*) e a velocidade de corrida em 30 metros (RV30, *running velocity over 30 meters*). Trinta e uma mulheres foram aleatoriamente designadas para os grupos VBT (n=16) ou PBT (n=15). Os grupos treinaram três vezes por semana ao longo de 12 semanas. Antes e depois do treinamento, foram determinados os valores de FSQ, VJ, PP, RV30, BMD, BMC, MM e EMG. O grupo VBT treinou a uma velocidade propulsiva média (MPV) de 0,68 ± 0,08 m s - 1, enquanto o grupo PBT treinou a 70-80 % de 1RM. O RT produziu aumentos significativos ($p<0,05$) nos dois grupos em FSQ (VBT 33,79 %, PBT 27,94 %), VJ (VBT 19,11 %, PBT 8,77 %), RV30 (VBT 6,27 %, PBT 1,66 %), PP (VBT 32,2 %, PBT 16,11 %), MM livre de gordura (VBT 3,7 %, PBT 2,64 %), BMC (VBT 0,39 %, PBT 0,25 %) e BMD (VBT 0,76 %, PBT 0,80 %). Não foram observadas variações significativas na atividade EMG em nenhum dos grupos. Por outro lado, foram identificadas diferenças significativas entre os dois grupos de treinamento em BMD, PP, BMC e RV30. Concluindo, o treinamento VBT pode fornecer um estímulo superior para induzir adaptações neuromusculares que geram melhorias significativas no salto vertical, na velocidade acima de 30 m, na potência do pedal, na densidade mineral óssea, e aumentos semelhantes ou até maiores na força máxima do agachamento, na massa muscular e no componente mineral ósseo, em comparação ao treinamento baseado em porcentagem. Além disso, o treinamento baseado em velocidade apresentou leves aumentos na atividade eletromiográfica de superfície.

Palavras-chave: ativação neuromuscular, força máxima de agachamento, massa muscular, salto vertical, treinamento de resistência, velocidade de deslocamento de carga.

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