



体育学院单共兵教授论文被《Science Bulletin》作为封面文章刊发

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日前,《Science Bulletin》第8期以封面论文刊发了我校体育学院客座教授单共兵博士撰写的论文《足球“倒挂金钩”技术可系统性训练吗?》。《Science Bulletin》由中国科学院主办,属于SCI综合类期刊,当前处于该类期刊前列,在国内外具有较高的学术地位,主要刊发国内外学术最前沿的研究成果,该篇论文首次对足球中的经典射门动作“倒挂金钩”进行了量化研究,提出了影响该项技术的主要因素。该篇论文也是《Science Bulletin》首次刊发体育类学术论文。中国足球发展已被作为国家战略推行,校园足球的开展不仅极大的深化了体育改革,更重要的是推动了素质教育的大力发展,促进了青少年体质健康与校园文化建设。对于足球技术的系统研究满足了当前社会、体育、教育发展的需要。2015年4月“陕西省校园足球研究与发展中心”落户我校体育学院,单共兵教授撰写的该篇论文为该中心的发展起到了积极地推动作用,这表明我校体育学院在科学研究上紧抓社会前沿,响应国家发展,在研究规划和水平上有了进一步的提高。

单共兵博士系加拿大莱斯布里奇大学终身教授,毕业于德国明斯特大学,获博士学位。国际英文期刊《艺术生物力学》杂志主编(Arts Biomechanics)、国际运动生物力学协会执委,莱斯布里奇大学生物力学实验中心创始人,近年来在运动生物力学类标志性刊物上发表论文30余篇,连续主持3项加拿大国家自然科学基金,且形成了以体育、艺术运动为主的生物力学研究体系。2012年受聘我校体育学院客座教授,在近三年中,单共兵教授邀请了体育学院多名学生、教师赴加拿大进行学习、合作研究,促进了体育学院办学的国际化水平。

论文摘要: 足球“倒挂金钩”技术给观众提供了令人惊叹的奇观瞬间,但少有球员在国家及国际级比赛中完成此精湛技艺。这一“魔术”般技能的稀有原因是:(1) 高风险、低回报,(2) 没有科学的方法来量化和揭秘该技能的动作要素。目前观察到背对球门和侧对球门2种踢法。我们用三维动作捕捉技术和人体运动生物力学模型对其的量化,结果表明下列要素起到决定性作用:(1) 髌关节的柔软性,(2) 踢球腿的“鞭抽”控制,(3) 时控;此外,侧对球门的踢法还有另一要素:起跳前的躯干逆向旋转将增大踢球的动量。完成踢球后的落地是训练时的心理障碍。分散吸收落地冲量可避免受伤。让更多的球员掌握“倒挂金钩”技术将进一步提升足球的魅力。——封面文章 p819

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Abstract In soccer, the bicycle kick has provided viewers moments of breathtaking spectacle that seem virtuosic in scope. The novelty of such moments is underscored by the rarity with which players have performed this complex skill during national or international tournaments. The rarity of these occurrences is both a product of perceptions that it is a high-risk, low return skill and by the fact that there is a dearth of scientific research on the biomechanics of the technique. Two genera can be discerned based on starting position: 1) back-facing the goal, and 2) side-facing the goal. The current study, using 3D motion capture technology and full-body biomechanical modeling, identifies elements that govern entrainment of the technique by examining jumping, kicking and falling phases of the skill

execution. Motor sequencing during the first two phases can be characterized by analyzing the following parameters: 1) angle between the player's thighs (humerus bones) upon take-off, 2) the whip-like control of the kicking leg, 3) timing between ball motion and joint coordination and, for the side-facing bicycle kick, 4) rotation of the player's trunk during the jumping phase. Dispersion of energy during falling after the kick is accomplished by sharing the load using a sequence of partial landings. Collectively, this information could help entrainment of the skill. Virtuosity in appearance, more frequent use of the kick can only enhance the excitement of the game.

Keywords 3D motion capture · Biomechanical modeling · Whip-like movement · Joint flexibility · Impact absorption of falling

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In soccer, the bicycle kick has provided viewers moments of breathtaking spectacle that seem virtuosic in scope [1]; but, can such virtuosity be systematically trainable? Perhaps the most memorable bicycle kick of all time was performed by Pelé from Brazil in 1965 [2]. More recently,

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