

Karate training effect in balance control in children with developmental coordination disorder

Cristiana MERCÊ^{1,2,3}, David CATELA^{1,2,3}, António VENCESBRITO^{1,2,3,4}, & Marco A. C. BRANCO^{1,2}

¹ Sports Sciences School of Rio Maior – Polytechnic Institute of Santarém (Portugal)

² Investigation Unite of Polytechnic Institute of Santarém (UIIPS) (Portugal)

³ Investigation Center in Life Quality (CIEQV) (Portugal)

⁴ International Martial Arts and Combat Sports Scientific Society – IMACSSS (Poland)

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1. Introduction

The developmental coordination disorder (DCD) is a motor disorder identified and recognized by the Diagnostic and Statistical Manual of Mental Disorders (DSM), which affects 6% of school-age children (Vaivre-Douret, 2014; Vaivre-Douret, et al., 2011). DCD children reveal problems in their development of fine and/or global motor coordination, difficulty in the motor control and learning, and in the acquisition of new motor skills (Vaivre-Douret, 2014). These difficulties in motor control and learning are expressed in many ways, such as a delay in achieving motor milestones, clumsiness, poor balance, difficulties in writing and drawing (Chang & Yu, 2010), poor postural control (Geuze, 2005), and difficulties in space and temporal organization (Wilson & McKenzie, 1998). All of those difficulties, affects the daily life of the children and, consequently, brings more problems and new difficulties such as academic delay or social isolation (Joshi, et al., 2015; Vaivre-Douret, 2014). One of the most prevalent problems is the postural control deficit, affecting 73% to 87% of the DCD children (Macnab, Miller, & Polatajko, 2001). An early diagnosis accompanied by an early intervention may help to decrease the negative effects of DCD and provide a better life quality (Smits-Engelsman, et al., 2013). The regular practice of martial arts such Karate and Taekwondo improve children motor skills, including postural control and balance abilities (Fong et al., 2014; Truszczyńska, Drzał-Grabiec, Snela, & Rachwał, 2015). These benefits are also present in children with DCD, recent studies revealed an improve in sensory organization and standing balance (Fong, Tsang, & Ng, 2012), and also an increase in isokinetic knee muscle strength at 180° and in static single-leg standing balance in DCD children undergo a 3 months of intensive taekwondo practice (Fong, Chung, Chow, Ma, & Tsang, 2013). Considering that one of the most prevalent problems in DCD children is the poor postural control, and the intensive practice of taekwondo has proved to improve balance, we pretend to verify if regular and continuous karate practice also improve balance in DCD children.

2. Methodology

The study will take place in city of Rio Maior including all primary schools. During the school period, it will be identified the children with probable DCD and in risk of developing DCD, which is a transition zone where the child does not have the disorder but has motor impairments. The identification will be made through the application of MABC-2 battery test, which allows to identify and describe the motor impairment in children (Henderson & Sugden, 2007). After the identification, it will be randomly made training and control groups by school, incorporating the a) probable DCD, b) in risk children and c) typical children, paired by sex and age. It will be only

* Email: cristianamerce@esdrm.ipsantarem.pt

included children without intellectual disability, visual impairment and neurological condition that affects movement.

The intervention phase will run during the second and third school periods and will be divided in two phases, a period of school each. During the second period only the training groups will have intervention and control groups will receive no training. During the third period the training and control groups switch, the old control group pass to be an experimental group where the children that did not have intervention can know training, and the children that already had training pass to be a control group and no receive training. In this way we can incorporate all children in the intervention, having in the first phase control groups with no training, which allows us to compare to training groups and understand if the intervention brings benefits; and in the second phase groups that training no more, allows us to evaluate if the intervention's benefits remains or disappear. According to previous studies training groups will have one hour weekly session during 3 months (Fong, et al., 2012, 2013), conducted by a black belt in Karate. Beyond this session children of training groups will have a prescribed set of karate home exercises to reinforce what they have learned in the class. Participants will be instructed to do the home exercises daily. It will be given a book with the exercises, figures, explanations and a checklist for parents to help and control their son's attendance to home training. The children in control groups will not receive training in this period. All groups, training and control, will pass by an initial, intermediate and final evaluation. To evaluate the static balance control it will be used a unilateral stance test (UST) with a computerized dynamic posturography (CDP) machine, analysing both legs (dominant and non-dominant) thought sway velocity of the center of pressure (COP) captured by the CDP. The participants will be barefoot and will use a security belt. It will be conducted three trials of 10 seconds for each leg, participants should place arms by the side of trunk, eyes looking forward to a visual target, and the hip of the non-supporting leg flexed at 45° (Fong, et al., 2012, 2013). Data for COP sway velocity will be compared by group (probable DCD, in risk and typical) and between evaluative moments (initial, intermediate and final).

It is expected, that in similarity with taekwondo studies, DCD children incorporated in training groups reveal an improvement in COP sway velocity with a significant decreased of values. We expect that these results also apply to in risk children group, revealing that karate can be a therapeutic leisure activity for DCD and in risk children population.

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