EFFECT OF MINI-HANDBALL MEANS ON THE SEPARATE DOMAINS OF COORDINATION (MANUAL DEXTERITY, AIMING AND CATCHING, BALANCE) IN PUPILS AT RISK OF DEVELOPMENTAL COORDINATION DISORDER (RDCD)

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Abstract. The article analyses the effect of a 12-week mini-handball programme on the three MABC-2 domains – manual dexterity, aiming and catching, and balance – in 44 primary-school pupils aged 9–10 at risk of developmental coordination disorder (RDCD). Linear mixed models showed that the time × group interaction was significant in all domains (p=0.011; p=0.003; p=0.006). The clearest advantage was recorded in aiming and catching: a significant improvement was observed only in the mini-handball group, and its post-test difference from the control group was 3.90 points (p<0.001). In balance, all groups improved, but the gain was largest in the mini-handball group.

Keywords: RDCD, developmental coordination disorder, mini-handball, MABC-2, manual dexterity, aiming and catching, balance, linear mixed models.

Introduction

Developmental coordination disorder (DCD) is characterised by a delay in motor skills relative to age, and its components manifest differently from one pupil to another [1; 3]. It is therefore important not to limit the evaluation of effectiveness to the total score but to examine the effect of an intervention on each motor domain separately: this allows training means to be selected in a targeted way. In this article, the abbreviation «RDCD» (risk of developmental coordination disorder; «RKB» in Uzbek) is used alongside the term «DCD».

Meta-analyses have shown that movement-based interventions are effective for pupils with DCD [2], and there is evidence that sport-game means (for example, mini-basketball) have a compensatory effect on the development of fundamental movements [4]. However, the effect of mini-handball across the MABC-2 domains has not been sufficiently studied.

Aim of the study: to determine the dynamics of manual dexterity, aiming and catching, and balance in pupils at risk of DCD under the influence of mini-handball means by comparing the groups.

Research methodology

The study was conducted in a general secondary school in the city of Urgench. Screening covered 216 pupils, of whom 129 scored below the 16th percentile on the MABC-2 [1]. After the inclusion and exclusion criteria were applied, 44 pupils were enrolled in the experiment and randomly allocated to three groups: mini-handball (n=15), motor skills (n=15) and control (n=14). Sessions were held for 12 weeks, three times a week, 90 minutes each. The mini-handball group practised passing, ball carrying, shooting and small-sided games; the motor-skills group performed hand-movement, aiming-and-catching and balance exercises; the control group took part in the school's traditional physical education lessons.

Assessment was carried out before and after the experiment on the three MABC-2 subscales: manual dexterity (MD), aiming and catching (A–C) and balance (BAL). A linear mixed model was

built for each domain, with time, group and their interaction as fixed effects and subject-specific random intercepts as the random effect. Models were selected using AIC, BIC and the likelihood-ratio test; Holm correction was applied to multiple comparisons (R 4.4.0, α=0.05).

Results

For the whole sample (n=44), the mean standard score rose from 5.50 (SD=1.41) to 7.43 (SD=2.08) in manual dexterity, from 6.93 (SD=2.13) to 8.50 (SD=2.55) in aiming and catching, and from 5.20 (SD=2.38) to 8.00 (SD=1.90) in balance. In all domains, the second-order (interaction) model outperformed the main-effects model (LRT: MD – 9.08, $p<0.05$; A–C – 11.64, $p<0.01$; BAL – 10.29, $p<0.01$).

In manual dexterity, time ($F(1;44)=42.89$; $p<0.001$) and the time × group interaction ($F(2;44)=5.04$; $p=0.011$) were significant, whereas the main effect of group was not ($p=0.141$). In aiming and catching, time ($F(1;88)=12.37$; $p<0.001$), group ($F(2;88)=7.20$; $p=0.001$) and the interaction ($F(2;88)=6.22$; $p=0.003$) were significant. In balance, time ($F(1;44)=56.93$; $p<0.001$) and the interaction ($F(2;44)=5.79$; $p=0.006$) were significant, while the group effect was not ($p=0.070$).

Table 1

Main comparisons by domain: estimate (p, Holm-corrected)

Domain	Mini-handball: pre–post	Motor skills: pre–post	Control: pre–post	Post: mini-handball – control
Manual dexterity	−2.87 (<0.001)	−2.20 (<0.001)	non-significant*	2.11 (0.010)
Aiming and catching	−3.33 (<0.001)	−1.67 (0.218)	0.43 (1.000)	3.90 (<0.001)
Balance	−4.53 (<0.001)	−1.80 (0.044)	−2.00 (0.027)	2.61 (0.006)

*Note: a negative estimate denotes a post-test gain. * The estimate is not shown; this comparison was reported as non-significant for the control group.*

In manual dexterity, the mini-handball and motor-skills groups improved significantly, whereas the change in the control group was non-significant; after the experiment, only the difference between the mini-handball and control groups was significant (2.11; $p=0.010$). In aiming and catching, a significant improvement was recorded only in the mini-handball group (−3.33; $p<0.001$); the gain in the motor-skills group did not reach significance ($p=0.218$). After the experiment, mini-handball exceeded the control group by 3.90 points ($p<0.001$), while the difference from the motor-skills group was non-significant (1.73; $p=0.218$). In balance, all three groups improved, but the largest gain was in the mini-handball group (−4.53; $p<0.001$); after the experiment, mini-handball exceeded the control group by 2.61 points ($p=0.006$).

Discussion

The results show that the effect of mini-handball is not uniform across domains. Aiming and catching – a domain that requires anticipation and visuomotor integration – is closest to the open-skill

nature of mini-handball: in the game, the movement of the ball and of partners changes constantly, and the pupil adapts passing, catching and shooting to these changing conditions. It was in this domain that the advantage of mini-handball was most evident. This finding is consistent with evidence that game-based means have a compensatory effect on fundamental movements [4] and is in line with studies indicating that perceptual-motor interventions can be effective for pupils with DCD [5].

The improvement of all groups in balance, including the gain in the control group (−2.00; p=0.027), may reflect the influence of activity within the school curriculum, repeated testing and age-related natural development; therefore, the effect specific to mini-handball in this domain should be assessed with caution. Limitations of the study: the sample is small (n=44), there is no follow-up measurement, and some between-group comparisons (for example, mini-handball versus motor skills) did not reach significance.

Conclusions and recommendations

In the 12-week mini-handball programme, the time × group interaction was significant in all three MABC-2 domains. The clearest result was obtained in aiming and catching, which provides grounds for applying mini-handball means first of all in work with pupils at risk of DCD in this domain. To develop manual dexterity and balance, it is recommended to combine mini-handball with specific exercises and, in the future, to verify the results with a larger sample and long-term follow-up.

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