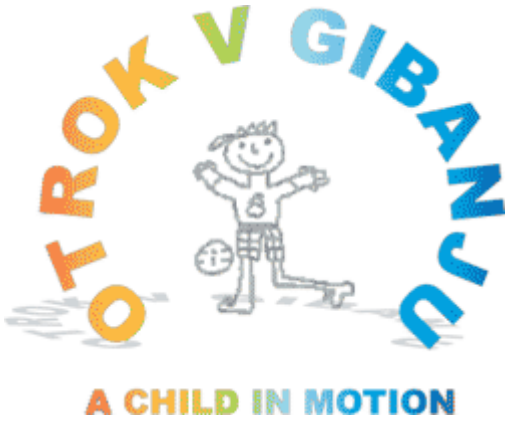

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INTEGRATION OF ENDURANCE RUNNING INTO CHILD'S MORPHOLOGIC AND MOTOR SYSTEM

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Abstract:
Upon entering the primary school, the children aged 7 years underwent an experimental specially programmed transformational procedure which lasted eighteen months. The transformational procedure was monitored by means of control variables from the morphological and motor subspace, and were measured every 9 months. The objective of the procedure was to monitor the growth and the development in both sexes. Due to special requirements that school puts before a child, the capacity to endure a longer work of submaximal intensity was analysed by measuring the performance achieved on a 3-minute run. This paper analyses the predictor relations between morphological and motor dimensions, running being the criterion in second and third control points regression analysis. The results showed that in all analyses the variability of the criterion could be significantly explained. A consistent increase of the variability of running, explained by means of the predictor group in compliance with the time spent under the treatment, was evident. Generally, it is extremely important to be aware of the integration of running endurance into the morphological and motor system precisely in congruence with the time spent under the treatment, since this is one of the basic sport characteristics of physical exercise.

Key words: boys, girls, treatment, integration

1. Introduction

There exists a vast number of possibilities and of the ways in which we can affect health and abilities in children, even the youngest ones. We want to decrease a know-it-all-type of behaviour and to reduce those activities that are not to bring about a qualitative support to the development of bio-psycho-social abilities of a child **(3, 20, 4, 1)**. From the very birth and on to maturity a child goes through several different developmental phases **(10)** in which particular characteristics, abilities and properties are manifested in different ways. However, in a sport sense it is evident that some abilities simply have the role of a foundation stone on which a well-balanced development of the whole organism is based **(9, 10, 12, 14, 6, 22)**. Endurance capacity per se is influenced by a number of factors, e.g. by genetic endowment, developmental rate, body composition and habitual physical activity suggest that training-induced adaptations in aerobic fitness have been extensively studied in adults, and some exercise scientists have recommended similar training programs for young people **(8, 2)**. Upon standard opinions some investigations **(16, 19, 7)**, shows different situations with different results. Anyway, endurance athletes must possess a high level of cardio respiratory fitness. Other investigators **(17, 18, 21)**, also find many differences in maximal oxygen uptake during childhood. It is particularly interesting to research the effects of the influence of a long-term training because of reflection of the total influence on the capacity of a child that also appear later **(11, 15, 5)**.

Endurance running is movement that activates different subsystems (cardiovascular, pulmonal, locomotor,...), and is result of set of movement control mechanism functions, so we can suppose an important fact that long-term training generates better "integration" of endurance running into different human subsystems.

2. Matherial and methods

The sample of examinees was comprised of 487 children, primary school first formers from Split, who, at the beginning of the experimental procedure, were 7 years +/- 2 months old. This sample was divided in four subsamples, namely: the experimental group – boys (131), the control group – boys (118), the experimental group – girls (123) and the control group – girls (115). All the children had no visible aberrations, and they were all able to participate in a normal program of work in primary school. **The sample of variables** was selected in such a way as to cover both the morphological and the motor status. The following variables from the morphological space were chosen: body height (ABHT), arm length (AALT), leg length (ALLT), biacromial width (ABAW), bicrystal width (ABCW), knee diameter (AKDR), wrist diameter (AWDR), body weight (ABWT), chest circumference (ACCC), lower leg circumference (ALLC), forearm circumference (AFAC), skinfold of the back (ASOB), upper arm skinfold (ASUA) and abdominal skinfold (ASAD). All the measures were taken according to the international biological program. The following variables were used for the assessment of the motor status: side steps (MSST), held part in the hang (MHPH), long jump from a standstill (MLJS), standing on the bench (MBST), polygon backwards (MPBW), sit-ups (MSUP), 20m run from a standing start (M20S), straddle forward bend (MSFB), hand-tapping (MHTP), foot-tapping (MFTP) and throwing the ball for distance (MBTR). The variable *3-min run* (F3MR) was used to assess the endurance running. **The data processing methods** related to beta-coefficients of standard linear regression analyses were condensed. The morphological and the motor variables had the status of predictors, and the *3-min run* was the criterion variable.

3. Results

Results in Table 1. shows that not all regresions are significant. It is somewhat surpising that predictor system in female control groups cannot significantly explain relations with 3-minute run. Similar situation exist in male control group, with only one significant individual predictor (ABWT). Experimental groups exposed significant prediction, especcially within male pupils. Multiple correlations (RO) are all of middle-sizes (0.45 - 0.48). Male experimantal group shows several different significant predictors, as body height (ABHT), knee diameter (AKDR) and skinfold of the back (ASOB), among which the knee diameter is positively oriented. Female experimental group express only two significant predictive transversal charactersitics: knee diameter (AKDR) and wrist diameter (AWDR).

Motor space (Table 2.), as another important human locomotor system, shows significant global prediction of 3-minute run in all tested situations. Multiple correlations (RO) are all of middle-sizes (0.43 - 0.56) and liitle bit higher than within morphologic system. Experimantal (male and female) samples express very strange description of 3-minute run prediction, with domination of throwing the ball for distance (MBTR) in individual prediction.

					ML								FM		
	E2		E3		C2		C3		E2		E3		C2		C3
ABHT	**-0.34**	*	**-0.35**	*	0.01		0.18		-0.25		-0.39		0.14		0.24
AALT	0.35		0.23		0.26		0.11		0.22		0.16		0.09		0.07
ALLT	-0.13		0.03		-0.31		-0.32		-0.16		-0.03		-0.13		-0.21
AWDR	0.21		0.20		0.21		0.26		0.25		**0.28**	*	0.30		0.26
AKDR	**0.32**	*	**0.26**	*	0.03		0.07		**0.30**	*	**0.27**	*	0.01		0.01
ABAW	-0.05		-0.14		0.00		0.11		0.00		-0.02		0.01		0.09
ABCW	0.19		0.08		-0.03		-0.05		0.15		-0.08		-0.06		-0.05
ABWT	-0.34		-0.22		**-0.71**	*	**-0.52**	*	-0.28		0.19		0.00		-0.17
AFAC	-0.18		-0.15		-0.28		-0.21		-0.11		-0.06		-0.04		-0.10
ALLC	-0.13		-0.18		0.30		0.15		0.04		-0.08		-0.32		-0.18
ACCC	0.11		0.18		0.34		0.11		-0.12		-0.18		-0.09		-0.12
ASUA	0.10		0.17		0.18		0.20		0.19		0.08		-0.06		-0.04
ASOB	**-0.49**	*	**-0.46**	*	-0.18		-0.08		-0.06		-0.16		-0.11		0.02
ASAD	0.37		0.30		-0.09		-0.09		-0.21		-0.17		0.11		0.09
DLT	0.20		0.19		0.23		0.21		0.19		0.20		0.19		0.17
RO	0.45		0.44		0.48		0.46		0.44		0.45		0.44		0.41
F	2.08		1.94		2.25		1.95		1.80		1.97		1.73		1.43
DF1	14		14		14		14		14		14		14		14
DF2	116		116		103		103		108		108		100		100
P	**0.02**		**0.03**		**0.01**		**0.03**		**0.05**		**0.03**		**0.06**		**0.15**

Table 1. Beta regression coefficients and testing in Morphology space

(** p<0.01. * p<0.05) (ML = male pupils, FM = female pupils, E = experimental group, C = control group, 2, 3 = second, third measurement)

					ML								FM		
	E2		E3		C2		C3		E2		E3		C2		C3
MSST	-0.03		-0.04		-0.10		-0.10		-0.06		-0.09		-0.16		-0.07
MPBW	-0.05		-0.04		-0.02		-0.01		0.00		0.00		-0.12		-0.10
MBST	-0.16		**-0.19**	*	**-0.24**	**	-0.14		0.06		0.02		0.04		0.03
MSFB	-0.02		-0.02		0.17		**0.19**	*	-0.18		-0.13		-0.02		-0.08
MHTP	0.04		0.02		-0.01		0.03		0.14		0.06		-0.02		-0.04
MFTP	0.02		-0.04		0.16		0.15		0.14		0.19		0.13		0.10
MLJS	0.13		0.18		0.02		-0.01		0.13		0.06		**-0.25**	*	-0.22
MBTR	**0.31**	**	**0.29**	**	0.15		0.13		**0.26**	**	**0.36**	**	0.07		0.04
M20S	0.16		0.10		**-0.31**	**	**-0.37**	**	0.19		0.14		**-0.30**	**	**-0.36**
MSUP	-0.11		**-0.18**	*	-0.07		-0.12		-0.08		-0.13		0.02		-0.04
MHPH	0.12		0.13		0.05		0.06		-0.04		-0.03		**0.20**	*	**0.24**
DLT	0.19		0.20		0.29		0.31		0.24		0.28		0.28		0.26
RO	0.43		0.45		0.54		0.56		0.49		0.53		0.53		0.51
F	2.51		2.79		3.90		4.34		3.14		3.88		3.65		3.34
DF1	11		11		11		11		11		11		11		11
DF2	119		119		106		106		111		111		103		103
P	**0.01**		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

Table 2. Beta regression coefficients and testing in Motor space

(** p<0.01. * p<0.05) (ML = male pupils, FM = female pupils, E = experimental group, C = control group, 2, 3 = second, third measurement)

Male group final situation express sit-ups (MSUP) and standing on the bench (MBST) as negative predictors. Control groups (male and female) shows common characteristic with 20m run from a standing start (M20S), but also some divergent characteristics like standing on the bench (MBST) and straddle forward bend (MSFB) with male pupils, and like held part in the hang (MHPH) and long jump from a standstill (MLJS) with females.

4. Discussion

Findings in this research accomplish some adult human characteristics as well as some differences were encountered. In child's situation, we can talk about stochastic intervals of work characterized with "uncontrolled" energetic output, which depends of actual interest and local motivation. As programmed process follows, the degree of recourses integration is expecting to increase and global as well as particular prediction too. Such situation retains with slightly tendencies to increase total prediction. In the same time, it is obvious that individual predictors became more stable. With process, more intensified different abilities became incorporated (mass optimization, fat tissue reduction, explosive force…), especially with boys. Control treatment, however, express characteristics that we can mark as "passive". Morphologic system retains more - lees intact (girls) or only suggests that total mass is strong negative predictor in endurance running (boys). In the same manner, we can explain activities with significant amount of force as negative predictors of endurance running. We can conclude that children's adaptation directs toward restructuring of mechanisms that control intensity of excitation in nervous system. It is indisputable that endurance running has different control mechanism than other motor activities. However, results obviously show that endurance running shares significant amount of common variance with morphologic and motor space, testified that all human (child) characteristics are really incorporated in common system. In this way the perceptions gain not only the statistical importance, but also the importance in information terms when drawing conclusions. This crucial fact has, of course, an outstanding sport importance, since it means that the integrating characteristics of endurance or aerobic work have been incorporated into the results of morphological and motor dimensions. Since we are talking about a period of 18 months, it is beyond any doubt that, together with the very growth and development, the systematic work in all the samples led to specific type of effects.

5. Conclusion

An 18-month specially programmed transformational procedure was conducted on the sample of 131 boys and 123 girls, aged 7 years. In order to control the effects, 14 morphological and 11 motor variables, which cover the morphological-motor space well, were used. The endurance running was followed up by the test *3-min run*. All the results clearly showed that the changes in the structure of the integration of endurance running into the morphological-motor system in the treated age group may most directly be connected with the treatment itself. Namely, not only were the values of the very criterion variable stable and increased in congruence with the duration of the treatment, but the very determination of the criterion by means of the predictive set was better. This was explained by the fact that the endurance running, that is, the important quality part of the transport system, are the basis for the development of all other abilities, therefore also of the motor abilities, and of the characteristics such as morphological ones. It is particularly interesting that such a situation is clear already in children who are 7 – 9 years of age, and that significant changes in this respect were caused by a one-and-a-half-year treatment.

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