

Relationships Between Chosen Motor Abilities and Aggression of Boys

by

Gregor Jurak, Janko Strel, Marjeta Kovac¹

The research relates to relationships between motor abilities and aggression. The study was conducted on a representative sample of 517 boys aged 11, 13, 15 and 17. The presented data is part of a more extensive study by Strel et al. (1996).

The level of motor abilities was evaluated by 26 tests while aggression was assessed by the Buss-Durkee's questionnaire. The relationships between motor abilities and aggression were evaluated by means of canonical correlation analysis.

Significant relationships between motor abilities and aggression were present only in thirteen year old boys. The common dimension is marked by the subcortical system for regulation of inhibition and excitation of nerve impulses that form the changes in the level of activation and by cortical control. It can be inferred that the first mechanism has the potential for the performance of the action in both sub-spaces, but due to the performance of a complicated motor task (motor space) or the social acceptability of the response to frustration (space of aggression) this mechanism is influenced by particular cortex centers.

Key words: motor abilities, aggression, boys.

¹ - University of Ljubljana, Faculty of Sport, Slovenia

Introduction

Prevalent values of modern way of life are reflected at all levels of man's activities. The effects of social development are varied and unforeseeable, positive and negative. Under given circumstances, education in social institutions is gaining in importance. Today, PE is directed not only at the development of motor abilities and physical characteristics but also at acquainting children with sport skills. It should also be a process of motivation for sport and the process of (secondary) socialization, which includes the development of social values, norms, ethical principles and behavioural patterns. Its successfulness is often affected by numerous outer factors such as:

Accelerated growth, faster maturation and changes in the level of some motor abilities during puberty and adolescence (Tanner, 1991; Strel, Šturm, Ambrožič, Leskošek, & Štihec, 1994; Conger & Galambos, 1997; Kovac, 1999; Strel, Kovac, Leskošek, Jurak, & Starc, 2002);

A different motivation structure of youth (Pavlikova 1995), when young people find themselves at the crossroads seeking their own identity and the teachers are confronted with numerous professional questions dealing with how to most suitably help an adolescent in order to protect him/her in the period of puberty against the negative self-image, lack of will, different forms of addiction, negative influence of the street and modern trends;

An imbalance between time spent on learning and leisure (Novak et al., 1993);

A disturbed relation between passive and active forms of leisure, due to a lack of quality sports programmes and very often a violent offer of the media, which guarantee easy and immediate satisfaction – children chose activities where they mainly sit and select sport and other physical activities less often (Novak et al., 1993; Kršnjakova and Pavlovicova, 1995);

Competition of many fashionable violent sport programmes that are often not professionally planned with school;

Competition as a prevalent form of school work;

Insufficient individualization and consideration of the needs of particular children, since the problems – concerning great diversity of children in school, their different talents and capabilities – still remain unsolved as well as children's special needs, differences in their development and in their interests;

Unfavourable material conditions.

Children and youth face these obstacles in the course of development differently. One of the outcomes to frustration includes aggression. The main aspect of this work was to evaluate the relationships between motor abilities

and aggression in the period before, during and after puberty. Puberty is a highly sensitive developmental period of adolescents. It is characterized by significant changes in physical and motor development of children (Strel et al., 1994; Strel et al., 2002), and at the end of it also by biological and sexual maturity. Most changes are determined by hormone concentrations. Simultaneously, an intensive development of other mental processes begins; the development of cognitive processes is gaining in importance.

The obtained findings could add to the knowledge concerning developmental characteristics of children and youth and they could be helpful for setting the guidelines of further development of PE programs. Suitable didactic approaches can decrease the influence of unforeseeable and unwanted effects of sport activities, especially if critical periods in the child's development are better described.

Material and methods

Subjects

The study was conducted on a sample of 517 boys aged 11, 13, 15 and 17. Regions stratified the sample while it was chosen randomly within the regions. It is a representative sample of Slovenia, because the chosen primary schools are situated in big and small towns and since different types of high schools were selected. The data was collected in a more extensive research carried out by Strel et al. (1996) entitled "Analysis of Developmental Trends of Motor Abilities and Morphologic Characteristics and the Relations of Both of Them with Psychological and Sociological Dimensions of the Slovene Children and Youth between the Ages of 7 and 18 in the Period 1970–1983–1993". The research material included subjects who were not excused from PE classes due to health problems and whose parents gave written consent for participation of their children in this project.

Variables

On the basis of a hypothetical model by Kurelic et al. (1975) and research conducted by Šturm (1970, 1977) and Strel and Šturm (1981), a group of 26 tests were carried out on a sample of the Slovene population. These tests were chosen to evaluate motor abilities of the studied sample. Due to the complexity and extent of the measurements, the tested subjects carried out less demanding tests twice. During data processing the second trials were taken into consideration. Tests that were more demanding were carried out once only.

The assessment of aggression was made by the Buss-Durkee's questionnaire.

Statistics

The relationship between the complex of motor variables and the group of variables of aggression were analysed by means of canonical correlation analysis. A value of $p = 0.01$ was considered statistically significant.

Results

The complexes of motor variables and variables of aggression are in a statistically significant correlation only at the age of thirteen ($p < 0.01$, Table 1).

Table 1

Relationships between complex motor ability variables and variables of aggression in individual age groups (Wilks' test)

| Age | Value | F | df | sign F |
|-----|--------|---------|-----|--------|
| 11 | .15208 | 1.11941 | 208 | .144 |
| 13 | .07393 | 1.34308 | 208 | .003 |
| 15 | .10687 | 1.17416 | 208 | .069 |
| 17 | .16329 | 0.94418 | 208 | .689 |

The canonical correlation analysis of both groups of variables formed eight pairs of canonical factors (Table 2). According to the Bartlett test, only the first one has a coefficient of a canonical correlation at the statistically significant level of $p = 0.01$. The first canonical root explains 32% of total variance.

Table 2

Canonical correlations of factors isolated in the space of motor variables and variables of aggression

| Root No. | Canon. Cor. | Sq. Canon. Cor. | Wilks λ | χ^2 | df | p |
|----------|-------------|-----------------|-----------------|----------|-----|---------|
| 1 | .719 | .516961 | .073840 | 273.61 | 208 | .001529 |
| 2 | .663 | .439569 | .152866 | 197.21 | 175 | .119867 |
| 3 | .558 | .311364 | .272766 | 136.41 | 144 | .661256 |
| 4 | .506 | .256036 | .396096 | 97.24 | 115 | .883533 |
| 5 | .460 | .211600 | .532413 | 66.19 | 88 | .960169 |
| 6 | .408 | .166464 | .675308 | 41.22 | 63 | .984701 |
| 7 | .371 | .137641 | .810172 | 22.10 | 40 | .990268 |
| 8 | .246 | .060516 | .939484 | 6.55 | 19 | .996237 |

The first canonical factor in the area of motor abilities is formed by the following variables: standing long jump, forward bend on the bench, sit and reach, hand drumming, hand and feet drumming, sit-ups 20 seconds and sit-ups 30 seconds (Table 3). The proportion of variance of the system of variables that is explained by the first canonical linear combination is low (1.182%).

Table 3

| <i>Structure of the canonical factor isolated in the motor space</i> | |
|--|----------|
| Variable | FACCAN 1 |
| plate tapping 20 seconds | - 0,235 |
| plate tapping 25 cycles | 0,116 |
| “1-foot tapping” | 0,258 |
| standing long jump | 0,593 |
| medicine ball throw | - 0,089 |
| sit-ups 60 seconds | 0,242 |
| polygon backwards | 0,246 |
| climbing and descending | - 0,260 |
| figure eight with a low obstacle | - 0,076 |
| running, rolling, crawling | 0,047 |
| running round three stands | 0,362 |
| forward bend on the bench | 0,809 |
| 60-m run | 0,089 |
| arm pull dynamometer | 0,101 |
| hand drumming | 0,554 |
| hand and feet drumming | - 0,542 |
| back arm twist | 0,087 |
| sit and reach | - 1,046 |
| standing on a low beam | 0,110 |
| flamingo balance | - 0,490 |
| sit-ups 20 seconds | 0,614 |
| sit-ups 30 seconds | - 0,865 |
| bent arm hang | 0,036 |
| match juggling | - 0,066 |
| accelerated run | - 0,399 |
| 600-m run | 0,046 |

The first canonical factor in the area of aggression is formed by the following variables: physical aggression, indirect aggression and negativism (Table 4). The proportion of variance of the system of variables of aggression that is explained by the first canonical linear combination is 17.776%.

The redundancy coefficients of the first pair of factors show that the differences among the values in motor variables can be explained in 12.781% with the canonical factor formed in the area of variables of aggression. The differences among the values of aggression can be explained only in 8.5% with the canonical factor formed in the area of motor variables. It can be established that the group of motor variables can be explained better with the canonical factor formed by the variables of aggression than vice versa.

Table 4*Structure of the canonical factor isolated in the space of aggression*

| Variable | FACCAN 1 |
|---------------------|----------|
| physical aggression | 0,527 |
| indirect aggression | 0,548 |
| irritability | 0,276 |
| verbal aggression | 0,313 |
| negativism | - 0,545 |
| hatred | - 0,053 |
| suspicion | - 0,203 |
| senses of guilt | - 0,203 |

Discussion and conclusions

The latent structure of the first canonical factor in the motor space (Table 3) consists roughly of two different sub-spaces. The first includes a repeated movement of the flexors of the trunk. Effective performance of these movements depends on the flexibility of the body in the sagittal plane which enables efficient usage of energy when performing sit-ups or stretching of the spine and hip region. The correlations with some variables of explosive power (Kovac, 1999; Jurak, 2002) show that the successfulness of quick sit-ups with the arms behind the neck depends on the mechanism of regulation of excitation intensity. This mechanism together with the one responsible for regulation of the duration of excitation as well as the mechanism of muscle tone and synergy regulation is responsible for this kind of movement.

Cortical control over movement is typical of the second sub-space. On the basis of perception from the environment and constant reverse connections, the motor programme for the performance of movement should be prepared and

coordinated when the carried out tasks are mostly unknown. Movement should therefore be efficiently coordinated, by the mechanism of movement structuring at the sub cortical level.

The common characteristic of the canonical factor is shown in a particular activation level required to successfully carry out short-time repetitive movement, which both sub-spaces have in common. The level depends on the capability of several consecutive intensive excitations of the nervous system in a short-time interval. The differences between both types of movement are related to energy and information output. Due to the importance of the transmission of nerve impulses through the synapses and the coordinated activity of agonists and antagonists, which is reflected in a suitable muscular tonus, this factor was called the mechanism for the control of excitation.

A similar connection was established by Šturm, Horga and Momirovic (1975) when studying motor abilities that depend on significant energy output and abilities that depend on the regulation of movement. Within the space of variables related to significant energy output the first canonical root, which indicated a general connection between these groups of variables, was composed of motor tasks, characterized by a high level of excitation intensity, whereas in the space of the variables of the informational type it was composed of complex motor tasks. Our findings are also confirmed by the definition of the functional mechanism for the regulation of excitation intensity provided by Gredelj, Metikoš, Hošek and Momirovic (1975). This mechanism is responsible for the general level of excitation; the nerve conduction velocity depends on the latter.

The formation of the canonical factor in the space of aggression (Table 4) is influenced to the greatest extent by variables of aggression, which are characterized by visible aggression directed mainly towards the environment and a high degree of mobility. Due to these characteristics the canonical factor was called manifest aggression.

We suppose that the pair of canonical factors share the sub cortical system, which regulates the level of inhibition and excitation of the nerve impulses through neuro-physiological mechanisms. Under the influence of the stimuli the changes in the level of activation are formed via this mechanism. The extent of these changes largely depends on the neuro-physiological capacities of man's response. Greater capacities enable a faster and more intensive response, which is reflected in the motor space via both components of movement. In the energy output, it is primarily reflected as explosive power. Simultaneously, as a result of excitation of the nervous system, muscular tone increases which is reflected in less pronounced flexibility. The information output can be seen primarily in

the formation of complicated movements as a consequence of information flow at the sub cortical level and the functioning of suitable cortical centres. In the space of aggression the functioning of this system is primarily reflected in those forms of aggression, which are shown in the immediate response directed towards the environment. Both dimensions share cortical control, as well. In the motor space the latter is reflected in a more successful performance of tasks with a complicated motor structure and in the space of aggression an important role is played by a child's perception of past experience and the treatment of aggressive responses from the environment and the resulting adaptation of responses to socially acceptable ones.

Such findings are in agreement with previous findings concerning the connection of energy potentials with aggression (Kuleš, 1977, 1980) and assumptions about the cognitive influence on the mechanism, which regulates variability of aggression within the theory of conative regulation mechanisms (Horga, 1993). They differ however, in the fact this research also establishes the information output of the mechanism for the regulation of the excitation intensity and the connection of this output with cortical action. This is in accordance with the findings that in cognitive processes the speed of data flow and processing is important (Lehr & Fischer, 1990).

These results confirm the findings concerning the entire development of a child and the findings of other scientists that aggression is not a simple response to increased activation; therefore, the individual's initial mental state plays an important role in planning aggression.

The explanation for significant relationships between chosen complexes existing only in thirteen-year-old subjects can be attributed to the period that is developmentally very interdependent. At this age, boys are in the middle of puberty. The common point of the development of motor abilities and aggression lies in great hormonal changes connected with the sexual development and general physical development. The mutual connection in the excretion of growth and sex hormones is manifested in a rapid physical growth that is shown in the development of a young person's muscles and in the disturbance of the established motor movement patterns (Strel et al., 1994, 2002). The activation of these hormones and physical changes also influence behaviour. This is also the period of great changes at the cognitive level. It is very important for a child in this period how he/she perceives the development of sexuality, cultural influences, and value judgements and prejudices.

It can be concluded that the methods for providing sports knowledge and the acquisition of motor abilities are more important than the level of development of motor abilities. Correctly planned sports activities can develop

constructive forms of aggression in children: aggression in trying to prove oneself, in self-discipline, in overcoming restrictions, in the tendency towards achieving perfection. Here, attention has to be directed to competition, since this form of activity generates most aggression. In younger children competition should not be the prevalent form of sport activities, whereas in youth such forms are important since they acquaint youth with the possibility of realizing their needs in a socially acceptable way. All children and youth can get encouraging experiences by means of constructive aggression and healthy self-assertion via school PE.

The prevalent activities in PE curriculum of the first three years of elementary school in Slovenia (Kovac & Novak, 1998a, b) encourage children to acquire different movement skills and use different sport aids with less direct physical contact. In later stages of elementary school and in high school, sport games in particular increase the possibility of frustration that manifest aggression. Teachers should decrease these circumstances with the help of teaching forms that emphasize cooperation and individual progress as well as with the help of adapted rules of particular games. At the same time, they should monitor precisely how children follow their directives and should reward the aggressive responses that manifest the permitted forms of behaviour and encourage the child's development of personal achievements. In physical exercises of adolescents, teachers should take into account their developmental characteristics. At this age a young person is very much aware of his/her body growth and changes. Physically they become equal to grown-ups, what gives them a sense of importance and the expectation to the same rights as adults. The more demanding the environment of a child, the more aggressive the demands of the rights connected with adulthood. Physical exercises should, thus, be organized in such a way that a young person takes part also in the planning and implementation of these activities. The PE curriculum in primary schools enables this.

A tendency has been observed to achieve something as fast as possible regardless of the numerous negative influences on a child's development. Many times it is the coaches and the club leaders or too ambitious parents who generate aggressive behaviour. The solutions should therefore be sought in the direction of a more valued work of teachers with suitable knowledge and in a more thorough assessment of the purpose of the activities of sports associations, and, on the other hand also in the direction of control exerted by suitable institutions.

References

- Conger, J.J., Galambos, N.L. 1997. *Adolescence and Youth. Psychological Development in a Changing World*. London: Addison-Wesley Longman.
- Gredelj, M., Metikoš, D., Hošek, A., Momirovic, K. 1975. Model of hierarchical structure of motor abilities. Results obtained by the use one of a neoclassical procedure for the assessment of latent dimensions. *Kineziologija*, 5 (1-2), 7-81.
- Horga, S. 1993. *Psychology of sport*, (in Croatian). Zagreb: Fakultet za fizicku kulturu Sveucilišta u Zagrebu.
- Jurak, G. 2002. The analysis of correlation between some motor abilities and aggression of boys aged 11, 13, 15 and 17, (in Slovenian, English summary). Ljubljana: Fakulteta za šport.
- Kovac, M. 1999. The analysis of correlation between certain motor abilities and fluid intelligence of schoolgirls aged 10 to 18 years, (in Slovenian, English summary). Ljubljana: Fakulteta za šport.
- Kovac, M., Novak, D. 1998a. Curriculum for PE in grammar school, (in Slovenian). Ljubljana: Zavod za šolstvo RS.
- Kovac, M., Novak, D. 1998b. Curriculum for PE in primary school, (in Slovenian). Ljubljana: Zavod za šolstvo RS.
- Kršnjakova, S., Pavlovicova, M. 1995. Structure of children's free time activities. In L. Komandel (Ed.), *Proceedings of the international conference Physical Education and Sports of Children and Youth* (pp. 64-66). Bratislava: Slovak Scientific Society for Physical Education and Sports, Faculty of Physical Education and Sport, Comenius University.
- Kuleš, B. 1977. Some relations between aggression and strength, (in Croatian). Zagreb: Fakultet za fizicku kulturu.
- Kuleš, B. 1980. The correlation of basic aggression with explosive strength and maximal force of attempted movement. *Kineziologija*, 10 (1-2), 87-99.
- Kurelic, N., Momirovic, K., Stojanovic, M., Šturm, J., Radojevic, D., Viskic-Štalec, N. 1975. Structure and development of morphological and motor dimensions of the youth, (in Serbian). Beograd: FFV, Institut za naucna istraživanja.
- Lehrl, S., Fischer, B. 1990. A basic information psychological parameter (BIP) for the reconstruction of concepts of intelligence. *European Journal of Personality*, 4 (4), 259-286.

- Novak, H., Žagar, D., Pisanski, M., Skerbinek, M., Strel, J., Štihec, J., Videmšek, M., Arko, U., Juricic, M., & Cerar, M. 1991. Psychosocial and physical state of primary school pupils from the point of view of school workload, (in Slovenian). Ljubljana: Pedagoški inštitut, Fakulteta za šport, Univerzitetni inštitut za zdravstveno in socialno varstvo, Inštitut za medicino dela.
- Pavlikova, A. 1995. The structure of interests of youth in the leisure time. In L. Komandel (Ed.), Proceedings of the international conference Physical Education and Sports of Children and Youth (pp. 79-81). Bratislava: Slovak Scientific Society for Physical Education and Sports, Faculty of Physical Education and Sport, Comenius University.
- Strel, J., Kovac, M., Leskošek, B., Jurak, G., Starc, G. 2002. Physical and motor development of children and youth in Slovenia in the years 1990-2000. Slovenska pediatrija, 9 (1), 90-101, (in Slovenian, English summary).
- Strel, J., Šturm, J. 1981. Reliability and structure of some motor abilities and morphological characteristics of pupils aged 6.5, (in Slovenian). Ljubljana: Inštitut za kineziologijo FTK.
- Strel, J., Šturm, J., Ambrožic, F., Leskošek, B., Štihec, J. 1994. Monitoring the physical and motor development of children and young people in the Republic of Slovenia on the basis of the »Information system of assessing, monitoring and evaluating the motor abilities of physical characteristics of school children in the Republic of Slovenia«. Zdravstveno varstvo, 34 (5-8), 369-372, (in Slovenian).
- Strel, J., Šturm, J., Štihec, J., Kovac, M., Tušak, M., Ambrožic, F., Leskovšek, B. 1996. The analysis of developmental trends of motor abilities and morphologic characteristics and the relations of both of them with psychological and sociological dimensions of the Slovene children and youth between the ages of 7 and 18 in the period 1970–1983–1993, (in Slovenian). Ljubljana: Fakulteta za šport, Inštitut za kineziologijo.
- Šturm, J. 1970. Reliability and structure of 28 tests of physical performance of pupils aged 8 and 12 years, (in Slovenian). Ljubljana: Zbornik VŠTK.
- Šturm, J. 1977. Reliability of motor tests, (in Slovenian). Ljubljana: VŠTK, Inštitut za kineziologijo.
- Šturm, J., Horga, S., Momirovic, K. 1975. Canonical relations between the abilities depending on the energy regulation and abilities depending on the movement regulation. Kineziologija, 5 (1-2), 123-154.

Tanner, J. M. 1991. Growth spurt, adolescent I.. In R.M. Lerner, A.C. Petersen, and J. Brooks-Gunn (Eds.), *Encyclopaedia of adolescence*, Vol. II (pp 419-424). New York: Garland Publishing.

Corresponding Author:

Gregor Jurak

Faculty of Sport, Gortanova 22, 1000 Ljubljana, Slovenia

tel.:+38641 743 088, fax:+3861 236 25 23

e-mail: gregor.jurak@fsp.uni-lj.si