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CORRELATION BETWEEN MOTOR DIMENSIONS AND NEUROTICISM OF BOYS 7 TO 11 YEARS OF AGE

1. Introduction

The objective of this investigation was to investigate the correlation between selected motor dimensions and personal dimension of neuroticism of children between seven and eleven years of age. The results of studies from the end of 19th century had shown that sport activity has certain influence on the development of human personality and personal traits, respectively (Tušak & Tušak, 1997). Correlation between motor dimensions and personal traits is very complex. A continuous return connection exists, in which certain personal dimensions determine successful accomplishment of motor tasks, while, on the other hand, they have return impact on the formation and development of certain patterns of behaviour and personal traits, respectively.

Motor abilities are those psychosomatic dimensions that determine motor efficiency and performance of motor tasks (Šturm & Strojnik, 1994). Numerous authors (Metikoš, Hofman, Prot, Pintar & Oreb, 1998; Hagg, 1995; Magill, 1998; Schmidt & Lee, 1999) had investigated the structure of motor abilities. The Kurelič model of motor abilities (1975) had been the most widely used in the investigations on the population of the Slovenian pupils. We also used it in our investigation.

Personal traits are dimensions that determine human reaction and behaviour, respectably, in different situations. They are crucial for understanding and prediction of human behaviour. Numerous modern studies in the field of psychology of personality that had been carried out in Europe and America had shown that the main characteristics of a personality can be almost entirely and with reasonable accuracy described with one model. The model consists of five orthogonal factors, which are extraversion, neuroticism, conscientiousness, agreeableness and openness (Little & Wanner, 1998). We focused only on dimension neuroticism.

In the dimension neuroticism, individuals whose characteristics were calmness, self-assurance, concentration, and emotionally controlled behaviour obtained high values. By contrast, so-called neurotics, who are characteristically tense, stiff, irritable, and anxious, obtained low values in this category. Arousal and lability of autonomous nervous system and sub-cortex centres represent the neuro-physiological background for this dimension (Eysenk, 1970-71). Sub-cortex centres of the individuals that are less emotionally stable are highly stimulated, their performance is labile and unbalanced, while the arousal itself lasts longer. The tests of co-ordination and balance require certain degree of composure, calmness and concentration, so the correlation with neuroticism could well be expected (Ismail, 1976, Kerin, 1985). Individuals with higher neuroticism have also difficulties determining the level of energy that they are willing to put into the performance. They invest more energy than is needed (Morgan, 1994) and have

constantly active muscles. Since the movement frequency tests and tests of flexibility require also relaxation of performing muscles we expect negative correlation.

2. Material and methods

2.1. The subject sample

The subject sample (scheme 1) encompassed 92 male pupils, which attended the first to fifth grade of primary school (7 to 11 years of age). They were involved in regular classes of physical education and were without physical injuries and morphological shortcomings. The sample was divided into several groups; each group consisted of pupils of the same grade.

Scheme 1: Subject sample by grade

Grade	Number	Age (years)
1	17	7,61 \mp 0,33
2	15	8,56 \mp 0,37
3	30	9,20 \mp 0,56
4	18	10,44 \mp 0,29
5	12	11,58 \mp 0,36

2.2. Variables

The variable sample used to assess the level of motor abilities consisted of twenty motor tests (description of the tests is available with the authors). To measure the level of flexibility we have used 3 motor tests. We obtained the results of shoulder (*Arm-twist with a stick*), trunk (*Bend and touch on a bench*) and hip (*Leg flexibility from lying on the back*) flexibility. Speed was measured with sprint test (*Sprint 10 m with running start*) and 3 movement frequency tests (*Tapping with better arm*, *Tapping with right leg*, *Tapping with left leg*). In the field of balance we measured the ability of maintaining balance (*Stand on a T bench*) and the ability of regaining balance position (*Flamingo balance*). Strength was measured with 5 motor tests, assessing the level of explosive strength of arms (*Throwing a heavy ball*) and legs (*Standing broad jump*), the repetitive strength of arms (*Pull, push on a bench*), trunk (*Sit-ups*) and legs (*Jumping over an elastic*) and also the static strength of arms (*Bent-arm hang*). With 5 co-ordination tests we measured the ability of efficient solving of space related problems (*Polygon backwards*, *Climbing and descending*, *Jumping over and crawling under*, *Figure of eight with bending*) and the ability of performing rhythmic motor tasks (*Arm drumming*). Personality dimension of neuroticism was measured with the Big Five Questionnaire for Children (Little and Wanner, 1998).

2.3. Methods

The obtained data was analysed with the SPSS statistical package. In the first phase of the analysis we computed for each grade group the basic statistical parameters. In the second phase, the association between all the measured variables was analysed

with correlation analysis and the correlation matrix were formed. We have used 5 % error level.

All the boys that took part in our investigation, as well as their parents, were acquainted with the measurement procedure. The parents had to give their written consent to their children taking part in the test. The measurements of motor abilities and personal trait of neuroticism were lead by accurately qualified personnel.

3. RESULTS AND DISCUSION

Personal dimension neuroticism showed high correlation with the tests of co-ordination and speed in case of the children in lower classes and with the motor tests of flexibility in case of the children in higher classes of primary school (Table 1). Children with expressed neuroticism have highly aroused central nervous system (Eysenk, 1970-71). This leads to difficulties in the performance of motor tasks that require calmness and concentration. Due to their restlessness and general nervousness, these children are not precise while carrying out a test (Little and Wanner, 1998).

Children in first class of primary school (6-7 years of age) showed typical correlation between neuroticism and the ascent and descent test (statistical significant coefficients are shown in coloured boxes). Boys that had higher results in the dimension neuroticism achieved also better results in this co-ordination test, although one would expect the correlation between neuroticism and co-ordination to be negative (Eysenk, 1970-71). Boys with higher degree of neuroticism are less calm and less collected due to higher arousal of their sub-cortical centres. This reflects in general nervousness, anxiety and concern. A test represents a stressful situation that was perceived by the boys with higher result in the dimension neuroticism as especially threatening. Therefore, it would be expected that they weren't very successful in the co-ordination tests. The negative correlation between the variables neuroticism, and ascent and descent can be the result of the very restlessness and concern of the boys. Higher degree of anxiety could induce more serious approach to the test task and, consequently, better results.

Table 1: Correlation between motor dimensions and neuroticism of schoolboys

Motor tasks	NEUROTICISM				
	Age 7	Age 8	Age 9	Age 10	Age 11
Flexibility					
Arm-twist with a stick*	-0,29	-0,21	0,11	0,50	0,69
Bend and touch on a bench	0,00	-0,33	0,08	-0,15	-0,28
Leg flexibility from lying on the back	0,30	0,01	0,11	0,23	-0,06
Speed					
Sprint 10 m with runing start*	0,29	0,30	-0,04	-0,15	0,55
Tapping with better arm	0,04	-0,34	-0,09	-0,36	-0,47
Tapping with right leg	0,11	-0,64	0,01	0,12	-0,52
Tapping with left leg	-0,02	-0,60	-0,16	0,14	-0,15

Balance					
Stand on a T bench	0,36	0,18	-0,11	-0,02	0,47
Flamingo balance*	-0,14	-0,13	-0,16	0,09	0,17
Strength					
Throwing a heavy ball	-0,07	-0,06	-0,17	-0,15	0,00
Standing broad jump	0,11	-0,35	0,26	0,18	-0,38
Pull, push on a bench	0,37	0,12	0,18	0,00	-0,43
Sit-ups	0,29	-0,50	0,13	0,19	-0,45
Jumping over an elastic	-0,12	-0,23	0,01	0,01	-0,47
Bent-arm hang	0,15	-0,03	0,07	-0,10	-0,35
Co-ordination					
Polygon backwards*	-0,08	0,04	0,10	0,22	-0,04
Climbing and descending*	-0,48	-0,04	-0,19	0,15	0,41
Jumping over and crawling under*	0,07	-0,13	0,01	-0,16	0,13
Figure of eight with bending*	0,33	0,22	0,04	-0,02	0,17
Arm drumming	0,04	-0,26	0,11	0,14	-0,12

(*a lower value is better)

Kerin (1985) had found out that neuroticism has negative influence on the performance of those tasks that require high degree of locomotor co-ordination. However, it doesn't have much influence on the performance of tasks that require more strength that they do high degree of co-ordination of moves. It could be possible that boys successfully performed the test due to their use of strength, and not due to co-ordination. It is most likely that higher degree of neuroticism enables them to maintain optimal level of arousal during the time of the performance of a task. When the children in first class of primary school are concerned, optimal anxiety and concern obviously have positive influence on the results of the motor-test, which had been confirmed also by other authors (Underwood, 1976; Kerin, 1985). Characteristic for individuals with higher neuroticism is also higher sensitivity that is shown in better kinaesthetic feeling (Ismail, Kane and Kirkendall, 1969) and consequently successful execution of the ascent and descent test.

Boys in second class of primary school (7-8 years of age) showed typical correlation between neuroticism and the movement frequency tests. The boys with expressed neuroticism did not achieve very good results when relaxation and concentration were required. The movement frequency tests reflect the activity of the inverse regulation centre, which is responsible for quick interchangeable descent and activation (agonists, antagonists) (Pistotnik, 1999). In order to carry out this change as quickly as possible, muscles have to be relaxed to some extent. However, boys with higher results in dimension neuroticism probably didn't achieve the needed calmness and relaxation and consequently didn't do very well on the test. Individuals with higher neuroticism have difficulties determining the level of effort that they are willing to put into the performance of a particular task. They tend to consider the task to be more

difficult than it really is, which makes them invest more energy than needed (Morgan, 1994). Due to higher sensibility for the stressful situation, which testing is, the children in second class of primary school have constantly aroused centres (Mrakovič et al., 1974). Since a muscle remains partially active all the time, its change from the role of agonist into the role of antagonist is less successful. Higher degree of neuroticism, therefore, conditions poor results in movement frequency tests.

Test results in the higher classes of primary school showed typical correlation of neuroticism with flexibility tests. Children that achieved higher results in personal trait neuroticism have also higher results in the test arm-twist with a stick test. It means that they have poorly movable shoulder area. Individuals with higher result in the dimension neuroticism are, according to Eysenk, tense and stiff. In order to achieve good results in the flexibility tests, one has to loosen particular muscle groups as much as possible, and achieve low muscle tone in the stretching muscles, respectively. Muscle tone is regulated by the central nervous system. When the nervous system of a neurotic person is highly aroused, it constantly sends nervous impulses into muscles (Morgan, 1994). The physiological basis of this phenomenon is inwardly caused tension that is probably manifested as hyperactivity of central nervous system, which sends high frequency impulses into effectors (Mrakovič et al., 1974). For that reason, muscles can not be entirely relaxed and children don't achieve maximal movement amplitudes.

4. CONCLUSIONS

Boys from single classes of primary school show some statistically significant correlation between motor variables and neuroticism. The correlation is in agreement with the results of previous investigations that are stated in the Introduction. In general, we can conclude that personal trait of neuroticism highly correlates with motor abilities, which are under the regulation of the central movement regulation mechanism.

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The objective of this investigation was to establish the correlation between selected motor dimensions and personal dimension of neuroticism of children between seven and eleven years of age.

The subject sample consisted of 92 schoolboys, attending the first five grades of the elementary school Kette-Murn in Ljubljana. Motor abilities were measured with a battery of 20 motor tasks (flexibility, speed, balance, strength and co-ordination) and neuroticism with the Big Five Questionnaire. The association between variables was analysed with correlation analysis.

Personal dimension of neuroticism showed high correlation with the tests of coordination and speed in case of the children in lower classes and with the motor tests of flexibility in case of the children in higher classes of primary school.

Key words: motor abilities, neuroticism, correlation, pupils