

PERCEPTUAL-MOTOR ABILITIES AND THEIR RELATIONSHIPS WITH ACADEMIC PERFORMANCE OF FIFTH GRADE PUPILS IN COMPARISON WITH OSERETSKY SCALE

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Abstract:

The main objective of this paper was to study the perceptual-motor abilities of fifth grade elementary school female pupils from four educational districts in Ahwaz, Iran, during the academic period of 2001/02. It was also intended to compare the pupils' perceptual-motor abilities with the Oseretsky scale. A total of 400 pupils, aged 10-11 years, 100 from each of four districts, were the subjects of this study. The Oseretsky scale and grade-point average of the final examination were used to measure the pupils' perceptual-motor abilities and their academic performance. The Oseretsky scale has 36 items that measure six sub-scales. The reliability and validity of this scale have been reported to be satisfactory in many previous studies. The findings of this study indicated that there were significant differences between the pupils' perceptual-motor abilities of the four educational districts. The results of the data analysis revealed that the pupils in district two showed a higher degree of perceptual-motor abilities as measured by the Oseretsky scale. A positive relationship between the pupils' perceptual-motor abilities and their academic performance was reported to be significant at $p < 0.05$. Finally, when the perceptual-motor abilities of fifth grade school-girls were compared using the Oseretsky scale, only 54 percent of them were ranked above the 50th % of the Oseretsky scale.

Key words: motor proficiency, grade point average, motor development

PERZEPTIV-MOTORISCHE EIGENSCHAFTEN UND DEREN ZUSAMMENHANG MIT LEISTUNG IN DER SCHULE BEI SCHÜLERINNEN DER FÜNFTEN KLASSE IM VERGLEICH MIT OSERETSKY SKALA

Zusammenfassung:

Das Ziel dieser Studie war, die perzeptiv-motorischen Fähigkeiten von Schülerinnen der fünften Klasse der Grundschule aus vier Bildungsbezirken im iranischen Ahwaz während des Schuljahrs 2001-2002 zu untersuchen. Die Intention war es auch, die perzeptiv-motorischen Fähigkeiten mit der Oseretsky-Skala zu vergleichen. Von den insgesamt 400 Schülerinnen im Alter zwischen 10-11 Jahren aus vier Bildungsbezirken wurden 100 für die Untersuchung ausgewählt. Die Oseretsky-Skala und die mittlere Note an der abschließenden Beurteilung wurden analysiert, um die perzeptiv-motorischen Fähigkeiten und die Schülerleistungen zu messen. Die Oseretsky-Skala hat 36 Punkte, die sechs Unterskalen messen. Die Verlässlichkeit und die Gültigkeit dieser Skala wurden in zahlreichen anderen Studien bewiesen. Die Ergebnisse dieser Studie lassen auf signifikante Unterschiede in den perzeptiv-motorischen Fähigkeiten unter den Schülerinnen aus vier Bildungsbezirken schließen. Eine Datenanalyse zeigte, dass die Schülerinnen aus dem Bildungsbezirk zwei einen höheren Grad an perzeptiv-motorischen Fähigkeiten an der Oseretsky-Skala zeigten. Ein positives Verhältnis zwischen den perzeptiv-motorischen Fähigkeiten der Schülerinnen und deren Leistung soll signifikant gewesen sein, und zwar $p < 0,05$. Abschließend wurden die perzeptiv-motorischen Fähigkeiten von Schülerinnen der fünften Klasse mit der Oseretsky-Skala verglichen, wobei nur 54 Prozent von ihnen oberhalb der 50sten Perzentile der Oseretsky-Skala rangierten.

Schlüsselwörter: motorische Fähigkeit, mittlere Note, motorische Entwicklung

Introduction

A child is a complex, composite and complete being and has an identity more than a mere combination of his/her components. That is, the general trend of development involves all aspects of the child's entity – his/her perceptual-motor, affective and cognitive development evolve together. Thus, the motor and perceptual developmental patterns of a child and his/her concrete mental operation should be identified and the impact of these patterns on personality, cognitive abilities and affective characteristics of children should be recognized by teachers, physical educators and sport sciences experts. Consequently, an awareness of the general trend of all of these developments, especially the perceptual-motor development in childhood, seems to be crucial in designing and planning instructional programmes. In fact, childhood is a period of concrete mental operations, but some children can, at this age, already pronounce and test hypotheses. It is worth noting that this study will focus only on the perceptual-motor abilities of girls aged 10-11 years.

There are different definitions of perceptual-motor development. Most physical educators and sport sciences experts define perceptual-motor development as a child's response to external stimuli that are perceived through visual, auditory and kinesthetic senses (Payne & Issacs, 2002; Haywood, 1993; Harrow, 1977). These experts believe that the main objective of most of the perceptual-motor programmes in schools is to generate special types of activities for children so that they can develop and evolve their perceptual-motor abilities along with the development of their other abilities in a balanced way.

Oseretsky identified the different factors responsible for perceptual-motor development in children aged 6 – 14 years. These factors are: general dynamic coordination, general static coordination, dynamic manual coordination, movement speed, synchronous-symmetrical voluntary movements and asynchronous-asymmetrical voluntary movements (Sloan, 1955).

He also demonstrated that the development of these factors influences the motor skills of children such as finger skills, hand-eye coordination, balance and the function of the large muscles of the body. He, then, succeeded in designing and cross-validating a test which was extensively used as the norm for measurement of children's perceptual-motor development (Sloan, 1955; Bailer, 1973). As a result, Oseretsky's studies caused other experts to study different aspects of children's perceptual-motor development and its relation to other factors like academic performance. The physical educators and sport scientists found a positive correlation between perceptual-motor development and academic performance in children. The students

with considerable success in perceptual-motor development showed a greater academic development (Delecatto, 1966; Cratty, 1979). Soleimani (1994) found a positive and high correlation between motor abilities and academic achievement. Levine (1987) found that writing mistakes in children were due to a lack of fine motor coordination, poor motor-visual evolution, perception disorders and disorders of attention. Green (1990) concluded that those physical education programmes which put an emphasis on perceptual-motor development increase the mental activity of children. Miletić, Srhoj and Bonacin (1999) investigated the relations of motor abilities in the initial status with successfulness in rhythmic gymnastics after a 6-month learning process of 100 girls aged 11 years. The results of the research showed a positive relationship between exercise of the motor-perceptual abilities and achievement in rhythmic structures, balance and coordination. Gonzales, Cortes and Dobbins (2003) also found that the effect of physical education programmes including the motor-perceptual abilities is the enhancement of academic performance in examinations in mathematics, reading and writing.

Considering the fact that the general development in childhood is mostly of a sensory-motor nature, physical education programmes in schools can probably have a fundamental role in the development of these abilities. In addition to creating a suitable condition for the development of motor skills, perceptual-motor programmes can be helpful in the development of other cognitive and affective abilities. Therefore, we felt necessary to study the perceptual-motor abilities of fifth grade elementary school female pupils. Since it was impossible to study all the aspects of development (cognitive, affective, psycho-motor) in a single study, this study focused on the objective of examining the development of the perceptual-motor abilities of fifth grade elementary school female pupils in four educational districts in Ahwaz, Iran. Also, to investigate the relationship between the different aspects of the perceptual-motor abilities on pupils' academic performance was the second goal of this study.

This study was intended to test the following hypotheses:

1. There is a difference between the perceptual-motor abilities of the fifth grade elementary school female pupils from four educational districts in Ahwaz.
2. There is a positive relationship between the perceptual-motor abilities and academic performance of the fifth grade elementary school female pupils in four educational districts in Ahwaz.
3. There is a difference between the academic performances of the fifth grade elementary school female pupils from four educational districts in Ahwaz.

Oseretsky's profile of the norm development scale was also used as the criterion variable for comparing the perceptual-motor abilities of pupils.

Methods

Population. The target population of this research were the fifth grade female pupils, aged 10-11 years, of four educational districts of Ahwaz, Iran, during the academic period of 2000/01 (N=14,733).

Sample. Through a cluster sampling, a total of 400 female students, 10-11 years old, was randomly selected from among the fifth grade elementary school female pupils from four educational districts, that is, 100 students from each district served as the subjects for this study.

Instrument. The Oseretsky scale was used to measure the development of the perceptual-motor abilities (PMA). Oseretsky constructed the original form of a scale for measuring perceptual motor abilities in 1923 in his attempts to explain the term motor proficiency. Many authors, most notably Lassner (1948), Sloan (1955) and Bialer (1973, 1974) reviewed and elaborated the scale into the form used in this paper. This scale consists of 36 items distributed in six sub-scales. Each one was used to measure the different aspects of perceptual-motor abilities as follows: general static coordination (GSC), general dynamic coordination (GDC), dynamic manual coordination (DMC), movement speed (MS), synchronous-symmetrical voluntary movements (SSVM) and asynchronous-asymmetrical voluntary movements (AAVM). Also, each sub-scale has its own measurement units. For example, the general static coordination (GSC) is used to measure the subject performance in seconds. Then different points were assigned to each subject, based on her performance on this sub-scale.

The reliability and validity coefficients of the new form of the scale for elementary school female

pupils were reported to be 0.99 and 0.88, respectively. These coefficients are significant at a probability level of $p < 0.05$. Later, Sloan and Bialer managed to normalize it and produced a profile which could be used as the standard norm for comparing the function of students' perceptual-motor development. This scale and its profile have been used successfully in Iran, too. Fallah (1991), Jafari (1997) and Vali (2000) normalized the perceptual-motor development scale on school-children. The reliability and validity of this scale were reported to be significant in these research studies. A grade-point average (GPA) of the final exams used for measuring the pupils' academic performance.

Results

Table 1 shows the mean and standard deviation of the perceptual-motor scale and its sub-scales, as well as the students' grade-point averages (GPA).

In order to test the first hypothesis, the result of the analysis of covariance (ANCOVA) showed that there was a significant difference between the total scores of the perceptual motor abilities scale of the fifth grade elementary school female pupils in the four educational districts (Table 2). However, when the scores of the sub-scales of the perceptual-motor abilities of these girls were compared, the scores of the motor abilities of the girls in the four educational districts in sub-scales *general dynamic coordination*, *movement speed* and *synchronous movement* were not reported to be significant at $p < 0.05$. The results of ANCOVA showed that the motor abilities of the girls in the four educational districts in other sub-scales, like *general static coordination*, *dynamic manual coordination*, *asynchronous-asymmetrical voluntary movement* and *total scale* showed significant differences. The *post hoc* Tukey's test between the mean scores of perceptual-motor abilities in the four educational districts showed the significant differences at

Table 1. The mean scores and standard deviations of the total scale and the sub-scales of PMA and GPA

District Index Scale	District 1		District 2		District 3		District 4		Total districts	
	M	SD	M	SD	M	SD	M	SD	M	SD
GSC	17.48	6.3	20.82	4.2	17.95	5.0	18.68	5.7	18.73	5.5
GDC	15.87	3.8	16.75	2.9	15.26	3.3	15.80	7.3	15.92	4.7
DMC	10.11	3.2	10.81	2.5	9.2	2.6	10.60	3.6	10.17	3.07
MS	18.48	6.05	20.49	10.3	18.78	4.4	19.00	6.02	19.18	7.05
SSVM	22.47	6.3	24.29	4.7	22.93	4.5	22.54	6.1	23.06	5.5
AAVM	26.06	7.2	28.89	7.4	25.78	8.1	24.68	5.7	26.35	7.3
Total scale of PMA	110.47	23.9	122.05	22.3	109.85	19.9	111.30	27.09	113.40	23.9
GPA	18.45	2.06	18.44	1.88	18.64	1.59	18.34	1.97	18.47	1.88

Legend: GSC – general static coordination; GDC – general dynamic coordination; DMC – dynamic manual coordination; MS – movement speed; SSVM – synchronous-symmetrical voluntary movements; AAVM - asynchronous-asymmetrical voluntary movements; PMA – perceptual-motor abilities; GPA – grade-point averages.

Table 2. The results of ANCOVA of the total scale and the subscales of PMA and GPA

Dependent Variable	SS	df	MS	F	p
GSC	662.96	3	220.99	7.84	0.001
GDC	151.887	3	50.629	3.88	0.15
DMC	185.04	3	61.68	6.70	0.001
MS	372.51	3	124.168	2.51	0.06
SSVM	189.691	3	63.23	2.22	0.09
AAVM	962.38	3	320.79	6.77	0.001
Total scale of PMA	11290.98	3	3763.66	7.54	0.001
GPA	4.12	3	1.37	0.52	0.67

Legend: GSC – general static coordination; GDC – general dynamic coordination; DMC – dynamic manual coordination; MS – movement speed; SSVM – synchronous-symmetrical voluntary movements; AAVM - asynchronous-asymmetrical voluntary movements; PMA – perceptual-motor abilities; GPA – grade-point averages; SS – sum of squares; df – degrees of freedom; MS – mean square; F – F-ratio variances; p – level of significance.

Table 3. The mean scores of PMA for comparisons between the pupils in the different districts

Level of significance	Standard Error	Mean difference	District
0.001	3.32	11.58	1-2
0.10	3.31	0.62	1-3
0.10	3.31	0.83	1-4
0.001	3.31	12.20	2-3
0.001	3.31	10.75	2-4
0.17	3.30	1.44	3-4

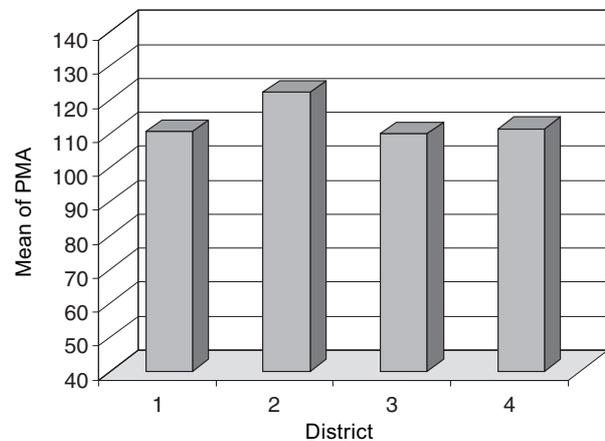


Figure 1. The mean scores of PMA to compare the pupils in the four (1, 2, 3, 4) districts.

$p < 0.05$. The perceptual-motor abilities of the girl pupils in district two were significantly different from the girl pupils in districts 1, 3 and 4 in the sub-scales. Table 3 and Figure 1 show the results of the Tukey's test.

Testing of the second hypothesis showed that perceptual-motor abilities had positive correlations with the academic performance of the fifth grade elementary school female pupils of all districts. Table 4 shows the correlation coefficients between the scores of PMA and GPA in the subscales and the total scale for the fifth grade elementary school

female pupils in all four educational districts. Although the magnitude of some of these coefficients was small, their reported significance might be due to the size of the sample randomly selected for this study.

The purpose of the third intended hypothesis was to test whether there was the significant difference between the academic performance of the subjects of four educational districts. The results

Table 4. Correlation coefficients between PMA and GPA of the female pupils in the four districts

Scale	District	District 1	District 2	District 3	District 4	Total districts
General static coordination		0.30**	0.20*	0.16	0.25*	0.22*
General dynamic coordination		0.30**	0.29**	0.06	0.22*	0.20**
Dynamic manual coordination		0.10	0.02	0.002	0.19	0.08
Movement speed		0.25*	0.22*	0.008	0.30**	0.05
Synchronous-symmetrical voluntary movements		0.24*	0.11	0.14	0.33**	0.22**
Asynchronous- asymmetrical voluntary movement		0.21*	0.25*	0.11	0.33**	0.22**
Total scale of PMA		0.33**	0.08	0.13	0.35**	0.23**

* significant at $p < 0.05$; ** significant at $p < 0.01$

of testing this hypothesis showed that there was no significant difference between GPAs of the fifth grade elementary school female pupils from different districts. The obtained F value was not significant at $p < 0.05$ (Table 4).

In addition to testing the previously mentioned hypotheses, the percentile ranks of the subjects obtained in PMA in this study were compared by the Oseretsky's motor development norm. The results of this comparison showed that out of the 400 subjects, only 54% of the pupils ranked above the median of the Oseretsky development norm (Table 5).

Table 5. Subjects' scores distribution in PMA scale and comparison of percentile ranks of these scores with the Oseretsky motor development norm.

Percentile Ranks (Oseretsky Norm)	Percentile Ranks (subjects)	Percentage	Frequency	Scores of PMA
	99	2.24	9	145-149
	98	1.0	4	140-144
99	97	1.74	7	135-139
96	94	0.15	6	130-134
93	93	6.2	25	125-129
88	87	6.2	25	120-124
83	80	8.2	33	115-119
75	72	7.96	30	110-114
65	64	10.4	42	105-109
56	54	9.95	38	100-104
45	45	9.72	39	95-99
35	35	9.40	37	90-94
27	26	8.9	35	85-89
20	18	4.68	18	80-84
13	13	4.23	17	75-79
9	9	2.74	11	70-74
	6	2.24	9	65-69
	4	4.23	15	60-64

Discussion and conclusions

The main purpose of this paper was to compare the perceptual-motor abilities of the fifth grade elementary school female pupils from four districts and their relationship with the pupils' academic performance. The main three hypotheses were tested. The findings of the first hypothesis showed that there was a significant difference between the scores of the fifth grade elementary school female pupils in four educational districts. It means that these districts did not offer the same opportunities for their fifth grade elementary school female pupils to develop their perceptual-motor abilities through their participation in school PE programmes.

Based on the comparisons between the mean scores of the sub-scales, it seems likely that the second district offered a better physical education

programme, which may be due to its qualified instructors, through which pupils could develop their perceptual-motor abilities and benefited more from participating in physical education classes activities.

Based on the findings of this study, it seems likely that the physical education programmes of the second educational district proved to offer more opportunities for the pupils of this district to develop their perceptual-motor abilities. The results of this study point to the fact that, if other districts will manage to develop and amend their physical education programmes, the pupils will probably find the chance to develop their perceptual-motor abilities through participating in sports and physical activities while attending the school.

The results also showed a significant positive correlation between the perceptual-motor abilities and academic performance of all the subjects. In other words, paying attention to improving and enriching physical education programmes of schools, particularly in elementary schools, may create suitable conditions for students to develop their cognitive abilities as well. The results obtained by testing this hypothesis are supported by the results of the research studies of Kephart (1969), Chisson (1974), Levin (1987), Sayre (1992), Soleimani (1994), Gonzales (2003), etc. Moreover, it can be stated that perceptual-motor function and cognitive function are bound to each other like the links of a chain, and children's perceptual-

motor skills development leads to the development and growth of mental functioning (Cratty, 1979; Green 1990). Although the results of this study support the findings of most of the other researchers, Singer (1968) and Salamat (1991) did not find any significant relationships between the perceptual-motor abilities and academic performance. A comparison of the pupils' perceptual-motor abilities ranks with the Oseretsky scale profile which showed that only 54% of subjects, in comparison with the standard norm, were above the median.

The ranks of 34% of students are above the 3rd quarter (75%) and the ranks of 20% of them are between the median (2nd quarter) and the 3rd quarter. With the rank of 54% of the subjects being above the median line, in comparison with the standard norm, it is indicated that there is no academic pro-

gramme to reinforce the development of pupils' perceptual-motor abilities.

The rank of 46% of students, in comparison with the standard criterion, was below average. In other words, on the basis of the results of this study, the efficiency of the physical education programmes of elementary schools that participated in this study, in connection to preparing the means for the perceptual-motor development of pupils, should be interpreted with caution. Although the rank of more than half of the pupils was reported to be above 50%, there should be more attempts to develop and amend the physical education programmes in schools. Since the physical education programmes in other schools are not very different from those of the schools which participated in this study, suitable conditions should be prepared in order to give more appropriate chances to pupils in early ages to develop their perceptual-motor abilities. Also, Miletic, Srhoj and Bonacin (1999) concluded that a

positive relationship existed between exercising and achievement of perceptual-motor abilities.

As the result of this research and the findings of other researchers indicate a positive relationship between motor activities and the development of cognitive abilities, schools should make more effort to enrich and improve their physical education programmes and pay more attention to the development of their pupils' perceptual-motor abilities. The findings of this study conform with the findings of Bratt (1982), Fallah (1991), Green (1990) and Gonzales (2003). The results of this study and those of other researchers point to the fact that the perceptual-motor abilities should receive special attention at all school ages. The identification and preparation of suitable conditions for the development and amendment of pupils' perceptual-motor abilities, may result in an improvement of their academic performance.

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ISTRAŽIVANJE POVEZANOSTI PERCEPTIVNO-MOTORIČKIH SPOSOBNOSTI I AKADEMSKOG USPJEHA UČENIKA PETOG RAZREDA OSNOVNE ŠKOLE TE USPOREDBA DOBIVENIH VRIJEDNOSTI SA OSERETSKYJEVOM SKALOM MOTORIČKOG RAZVOJA

Sažetak

Uvod

Dijete je složeno biće i njegov je identitet više no jednostavna suma različitih dijelova. Drugim riječima, opći trend razvoja uključuje sve aspekte dječjeg bivanja i djelovanja: perceptivno/motoričke sposobnosti, afektivni i kognitivni razvoj evoluiraju zajedno. Stoga, pri dizajniranju i planiranju programa učenja, osnovno je poznavati razvojne osobitosti djeteta, osobito dinamiku razvoja perceptivno-motoričkih sposobnosti u djetinjstvu. Oseretsky, navodi različite faktore perceptivno-motoričkog razvoja kod djece u dobi od 6 do 14 godina. Pokazao je da razvoj tih faktora utječe na razvoj motoričkih vještina u djece. Također je osmislio i validirao test koji se široko koristio kao standard mjerenja dječjeg perceptivno-motoričkog razvoja (Sloan, 1955; Bailer, 1973). Uzevši u obzir činjenicu da je razvoj u djetinjstvu primarno senzorno-motorički, programi nastave tjelesnog odgoja u školama mogli bi imati ključnu ulogu u razvoju tih sposobnosti. Kako bi se stvorili odgovarajući preduvjeti potrebni za razvoj motoričkih sposobnosti, programi u okviru kojih bi naglasak bio postavljen na razvoj perceptivno-motoričkih sposobnosti mogli bi biti od pomoći i za razvoj drugih kapaciteta, npr. kognitivnih i afektivnih. Sukladno tome, činilo se potrebnim proučiti različite aspekte perceptivno-motoričkih sposobnosti djevojčica petog razreda osnovne škole. Točnije, svrha ovog rada bila je ispitati perceptivno-motoričke sposobnosti učenica petog razreda četiriju edukacijskih regija u Ahwazu (Iran). Drugi je cilj istraživanja bio proučiti povezanost perceptivno-motoričkih sposobnosti učenica s njihovim akademskim uspjehom. Oseretskyjeva skala profila razvojnih normi također je korištena kao kriterij s kojim su se uspoređivale vrijednosti dobivenih perceptivno-motoričkih sposobnosti učenica.

Metode rada

Ispitanici. Od ciljane populacije odabrano je prvo 400 učenica petog razreda iz četiriju edukacijskih regija u Ahwazu, Iran. Potom je odabrano po 100 učenica raspoređenih po slučaju činilo su buzorak za svaku regiju.

Instrumenti i varijable. Kako bi se izmjerio stupanj perceptivno-motoričkog razvoja djevojčica primijenjena je Oseretskyjeva skala (PMA) koju čini šest subskala: statička i dinamička koordinacija, dinamička manualna koordinacija, brzina po-

kreta te sinkroni i asinkroni voljni pokreti. Pouzdanost i valjanost ove skale pokazale su se dobrima; dobivene su vrijednosti korelacija $r=0.99$ i $r=0.88$ (Sloan, 1955; Bailer, 1973), a oba su koeficijenta značajna uz $p<0.05$. Slične su vrijednosti i ranije dobivene na uzorcima iranskih ispitanika (Jafari, 1997; Vali, 2000). Ukupna prosječna ocjena (GPA) završnih ispita korištena je kao mjera akademskog uspjeha.

Rezultati

Rezultati analize kovarijance pokazuju statistički značajnu razliku rezultata na PMA skali kod djevojčica iz različitih edukacijskih regija. Tukeyjevim *post-hoc* testom utvrđeno je da se perceptivno-motoričke sposobnosti učenica u regiji 2 statistički značajno razlikuju od djevojčica u regiji 1, 3 i 4, i to na razini opće statičke i dinamičke koordinacije, dinamičke manualne koordinacije, brzine pokreta, sinkronih i asinkronih voljnih pokreta te s obzirom na ukupni PMA rezultat.

Rezultati pokazuju da perceptivno-motoričke sposobnosti statistički značajno pozitivno koreliraju s akademskim uspjehom djevojčica petih razreda u svim regijama. Nije dobivena statistički značajna razlika u akademskom uspjehu djevojčica petih razreda iz različitih regija ($F=0.52$, $P=0.67$). Osim toga, postotni rangovi ispitanica uspoređeni su s normama prema Oseretskyjevoj skali motoričkog razvoja. Rezultati usporedbe pokazali su da je samo 54 % ispitanica bilo rangirano iznad vrijednosti od 50 %.

Rasprava

Na temelju rezultata ovog istraživanja čini se da programi tjelesnog odgoja u drugoj edukacijskoj regiji pružaju više mogućnosti učenicama za razvoj perceptivno-motoričkih sposobnosti. Prema tim rezultatima moguće je naglasiti činjenicu da, ukoliko i ostale regije razvijaju i izmijene vlastite programe tjelesnog odgoja, učenici mogu dobiti šansu za povećanje svojih perceptivno-motoričkih sposobnosti kroz djelovanje u okviru sporta i tjelesnog vježbanja. Rezultati ovog istraživanja također pokazuju značajnu i pozitivnu korelaciju perceptivno-motoričkih sposobnosti i akademskog uspjeha na razini cijelog uzorka. Drugim riječima, poduzimajući neke korake za poboljšanje i obogaćivanje edukacijskih programa vježbanja u školama, moguće je stvoriti odgovarajuće uvjete i za kognitivni razvoj učenika. Usporedba rangova perceptivno-motoričkih sposobnosti učenica sa profilima normi prema Oseretskyjevoj skali pokazalo se da je samo 50

posto učenica iznad medijana (rang 50). Dobivene rezultati i nalazi ostalih istraživanja indiciraju pozitivnu povezanost motoričke aktivnosti i razvoja kognitivnih sposobnosti. Stoga bi bilo nužno da škole ulažu veći napor kako bi obogatile i poboljšale svoje programe tjelesnog odgoja te da više pažnje posvete razvoju perceptivno-motoričkih sposobnosti učenika. Dobiveni rezultati potvrđuju nalaze Bratta

(1982), Fallaha (1991), Greena (1990) i Gonzalesa (2003). Svi ti nalazi zajedno ukazuju na potrebu za nastavkom rada na razvoju perceptivno-motoričkih sposobnosti u školskoj dobi. Pripremajući odgovarajuće uvjete za razvoj i nadogradnju perceptivno-motoričkih sposobnosti učenika, moguće je posredno djelovati i na poboljšanje njihovih akademskih postignuća.