THE INFLUENCE OF MOTOR EXPERIENCE ON MOTOR CREATIVITY (FLUENCY) OF PRESCHOOL CHILDREN

Nataša Sturza Milić

Preschool Teacher Training College "Mihailo Palov", Vršac, Serbia

Original scientific paper

Abstract:

The aim of the paper was to consider the relation between motor creativity (fluency) and motor experience in preschool children. According to contemporary creativity theories, experience and knowledge has an important role in the formation of a critical level of motor behavior below which creativity is not possible. Insufficiently stimulated and underdeveloped motor skills and knowledge at this age can be the cause of decreased or 'slumbered' motor creativity. Estimation of motor performance (motor testing by means of the validated battery of seven motor tasks) and motor creativity (Torrens TCAM test) has been carried out in Vršac on the sample of 154 preschool children aged 6 to 6.5 years. The results show that motorically more competent children scored better in TCAM test tasks. The obtained results indicate the need to provide preschool children with suitable conditions leading to their optimal motor development and creative motor expression.

Key words**:** *motor behavior, divergent production*

Introduction

Children motor creativity is a phenomenon which has been modestly studied, in spite of the fact that creativity is one of the most appreciated human traits (Renzulli, 1994; Sternberg & Lubart, 1993). It is accepted that all children are creative by nature, and that the (non)manifestation of creativity depends on the environment and intrinsic motivation. Furthermore, in an attempt to explain the nature of creative behaviour of a child, it must be taken into consideration that childhood has its own features and specific characteristics that makes it different from any other period of an adult life. Motor creativity can be defined as an ability to produce numerous and original motor responses to a stimulus (Wyrik, 1968). Majority of the well-known motor creativity concepts are based on the Gilford's (1967, 1977) theory and divergent production factor. Sub factors of divergent production — fluency, originality, flexibility and elaboration are considered the main components of creativity. Fluency is in correlation with originality, while original ideas appear after a long series of stereotypical ones. According to the investment creativity theory of Sternberg et al. (Sternberg, O'Hara, & Lubart, 1997), creativity demands acquisition and/or development of six different components: abilities, knowledge, cognitive style, personal features, motivation and environment. Creative act is supplemented by experience (knowledge) and skills (practical abilities) necessary for the realization of an idea. Highly productive individuals (even children) are characterized by three groups of abilities which overlap mutually: above average ability in a certain domain (does not necessarily have to be superior), motivation (dedication to the task) and creativity. It is necessary to ensure appropriate learning experience in order to promote interaction of all the components of giftedness in a way as to provide occasions, resources, as well as support to the development and application of gifted behaviour (Renzuli, 2006; Šefer, 2000, 2005). According to modern theories of creativity, knowledge has an important role in the formation of a critical knowledge-level under which creativity is not possible (Sternberg, et al., 1997).

Participation and performance in physical education and sports ask for the development of many complex movement patterns in children. Majority of these movement patterns are anchored in natural forms at preschool age, so that the general movement pattern becomes a base for a certain number of special skills to be mastered by a child in time (Sturza Milić, 2012b). Motor performance of a child depends to a great degree on situations in which basic movements are regularly appearing, as well as on the existence of conditions for the expression of a variety of movement patterns and provision of problem situations for motor task solving (Gallahue, 2010; Sturza Milić, 2009c, 2012a; Žuvela, Božanić & Miletić, 2011). Unfortunately,

children are not provided nowadays with optimal conditions (regarding both the environmental and educational conditions) as regards physical activity and such a reality has negative effects on their overall development. Decreased physical activity levels in this period of life, i.e. at preschool age, has negative effects on general quality of life, i.e. health, family, relationships (Međedović, et al., 2014; Pišot, 2012; Sturza Milić, 2012b, 2014). Insufficiently stimulated and underdeveloped motor skills and motor knowledge in children can be a cause of decreased or "slumbered" motor creativity which can have unfavourable effects on motor and overall development of a child (Sturza Milić, 2009b). Some studies focused on preschool children motor creativity, or more precisely, on the differences between boys and girls in motor creativity (Sturza Milić, 2009a, 2009b) point to the fact that certain types of motor knowledge in the case of the studied preschool children (especially girls) are too low and that the phenomenon has been reflected on motor creativity manifestation. The above outlined research findings and insights refer to the statement that the relation between motor achievement (motor skills and knowledge) and motor creativity (fluency) in the case of preschool children is significant but insufficiently explicated issue of theory and practice, especially in the field of education. As a consequence, the aim of the research was to examine the relationship between motor achievements and motor creativity (fluency) of preschool children.

Method

Participants

The study included a total of 154 children, aged 6 to 6.5 years. All the children attended preschool daycare institutions in Vršac. The children included in the sample were healthy, with no physical disabilities or other obvious deficits, and came from different milieus. A written informed consent was obtained from all the parents of children prior to the study. The study was in accordance with the Code of Professional Ethics at the University of Belgrade (ethical standards for scientific investigations involving human participants) and the Code of Professional Ethics for the Medical Chamber of Serbia (Article 22; Službeni glasnik, RS, 121/2007). The research was undertaken in 2013.

Procedure

The whole sample was subjected to motor testing by a motor task battery. Having in mind that we are talking about preschool children, motor tasks were aiming at motor skill estimation, as well as children's motor knowledge (in the case of motor testing, it is not possible to measure skills separate from knowledge, especially at younger age; Bala, Stojanović & Stojanović, 2007; Findak, et al., 1998; Gajić, 1985; Gallahue, 2010). Having undertaken motor testing, the next step was to evaluate motor creativity (fluency), again on the whole sample. The testing was carried out individually due to a specific age of the subjects. Each child was recorded in order to undertake additional, i.e. further analysis and more precise assessments.

Instruments

Motor effectiveness was estimated according to application of the battery of seven motor tasks:

Running over 20 m (R20) — sprinting speed

Standing long jump (SLO) — explosive strength

Obstacle course backwards (POB) — coordination of the whole-body movement patterns

Moving hands along the bent surface (MHBS) — muscular endurance of the shoulder girdle and arms

Tapping rate (TAP) — speed of alternate movements

Deep forward bent in a straddle seat (DSS) — flexibility

Sit-ups (SIU) — strength of abdominal muscles

Motor tasks were adjusted to the sample of children. The tests showed optimal measuring characteristics in previous research (Bala & Popović, 2006; Međedović, et al., 2014; Sturza Milić, 2009a).

Motor creativity was evaluated according to Torrance's test *Thinking Creatively in Action and Movement* (TCAM), which is standard in testing preschool children (Torrance, 1981). The used problem task was the following: *In how many different ways can you carry a ball?* However, it was slightly modified compared to the original Torrence's TCAM (in the original TCAM test the problem was: *In how many different ways can you throw the ball at the basket?*). The test of TCAM problem tasks are: *In how many different ways can you move*? *What can you do with a plastic glass*?, etc. TCAM produces three types of results — fluency, originality and flexibility. In this research only one element of creativity has been considered — fluency. When measuring motor creativity, fluency can be defined in terms of the number of relevant movement responses, i.e. motor reactions (motor movement quantity). Consequently, fluency (CFLU) was calculated according to the counting of all successful motor responses of a child. In order to check reliability of the used test, retesting has been undertaken in the case of the problem task: *In how many different ways can you carry a ball?* (fluency — CFLU). According to the obtained statistically significant coefficient of correlation (for CFLU r=.84), as well as the value of Cronbach alfa coefficient under the classical sum model (CFLU Cronbach alfa=.9223), it can be concluded that the used test was of optimal reliability.

Data processing

Data processing referred to the calculation of main descriptive indicators and the indicators of deviation from the normal distribution of motor variables (SLO, SIU, POB, MHBS, DSS, TAP, R20), as well as motor creativity variable (CFLU). In order to confirm the link between the variables of motor achievement and motor creativity (fluency) the Pearson's linear correlation was used.

Results

Tables 1 and 2 show the basic descriptive indicators and the indicators of deviation from normal distribution for motor variables and the variable of motor creativity (fluency):

The next step was to correlate the results (Pearson's linear correlation) obtained by the motor testing and motor creativity testing. Table 3 shows the results obtained according to the correlation of all motor variables (SLO, SIU, POB, MHBS, DSS, TAP and R20) and the variable of motor creativity CFLU (fluency).

Discussion and conclusions

It can be noticed that the majority of motor variables statistically significantly correlated with motor creativity (fluency) – CFLU. The result leads to the conclusion that in the case of some motor tasks there is a link between motor performance and motor creativity, or more precisely, the ability to produce

Table 1. Main descriptive indicators and the indicators of deviation of normal distribution for motor variables (N=154)

Motor Variable	Min	Max	M	SD	Sk	Ku
SLO	62.00	133.00	103.998	15.125	-.607	.093
SIU	6.00	40.00	21.445	3.9192	1.497	4.456
POB	13.78	37.65	29.148	6.014	-.890	.199
MHBS	8.34	36.62	18.645	4.765	.867	1.345
DSS	24.94	53.12	38.954	6.267	.063	-.479
TAP	11.00	27.00	19.944	3.345	.519	.499
R20	4.65	6.12	4.898	.3715	.279	.594

Note: Min – minimum value, Max – maximum value, M – arithmetic mean, SD – standard deviation,
Sk – skewness, Ku– kurtosis
SLO – standing long jump, SIU – sit-ups, POB –polygon with obstacles backwards,
MHBS – moving hands along bent surface, DSS – deep forward bent in a straddle seat
TAP – tapping rate, R20 – running over 20 m

Table 2. Main descriptive indicators and the indicators of deviation from normal distribution for the variable motor creativity (fluency – CFLU)

Variable	N	Min	Max	M	SD	Sk	Ku
CFLU	154	2.00	23.00	11.39	3.500	.034	.098

Note: N – number of subjects, Min – minimum value, Max – maximum value, M – arithmetic mean,
SD – standard deviation, Sk – skewness, Ku – kurtosis

Table 3. Correlation coefficients (r) and the achieved level of significance (p) between the motor variables (SLO, SIU, POB, MHBS, DSS, TAP and R20) and the variable of motor creativity (fluency – CFLU)

Motor variables	CFLU
Standing long jump – SLO	**r=.454* p=.000**
Sit-ups – SIU	r=.234 p=.162
Polygon with obstacles backwards – POB	**r=-.438* p=.000**
Moving hands along bent surface – MHBS	r=-.519 p=.014
Deep forward bent in a straddle seat – DSS	r=-.045 p=.711
Tapping rate – TAP	**r=.378* p=.000**
Running over 20 m – R20	**r=-.413* p=.000**

of creative motor responses. It was assumed that the motorically more successful children in the stated motor tasks would achieve better results in the test of motor creativity, that is, that they would be able to give a higher number of motor responses to the given tasks in comparison to the children who were less motorically successful. The highest correlation (r=.454; p=.000) with CFLU (fluency) is shown in the case of motor task *standing long jump* – SLO and the task *obstacle course backwards* – POB (r=.438; p=.000). The lowest correlation (r=.378; p=.000) is evident in the case of *tapping rate* – TAP. It should be noted that numerous authors have suggested that with children the motor task *long jump* is not to estimate explosive strength (as it is the case with older children and adults), but the coordination of

the whole body (Koren, Šimunič, & Pišot, 2011; Kukolj, 2006; Starosta & Jevtić, 2007; Sturza Milić, 2009a, 2014). It is similar to the motor tasks *running over 20 m* – R20 and *tapping rate* – TAP, which do not originally estimate speed and the speed of alternate movements; in the case of children, these tests are used for estimation of the way they solve coordination problems (Bala & Popović, 2006, Kukolj, 2006). It is between coordination as a motor ability and intellectual abilities (especially with children of younger age) that a link has been noticed in numerous studies (Ismail, 1976; Sturza Milić, 2009a, 2012a). Having in mind that in the test of motor creativity a child solves a specific motor problem (he/she should reflect on possible solutions, to remember the ways of carrying a ball), it might be that, among other things, this very moment contributed to the link establishment between the mentioned motor tasks and CFLU (fluency). The motor variables of the tasks *moving hands along bent surface* – MHBS, *sit-ups* – SIU, as well as *deep forward bent in a straddle seat* – DSS, i.e. the motor tasks predominately requiring strength as a motor ability, as well as flexibility, have not established statistically significant links with the motor creativity variable (fluency). In spite of the fact that links between motor achievements and creativity have been established, the research has shown low results in the fluency component (CFLU), which can be brought into relation with the level of children's motor knowledge that is apparently too low. Namely, fluency is in correlation with originality, while original ideas appear only after a large number of stereotypic ones. It is beyond dispute that other components of personal traits of children should also be kept in mind. Consequently, a fact should be respected that at younger age motor creativity of children should be studied in multivariate fashion (Sturza Milić, 2009a, 2012a). Due to the fact that the results of the research show a correlation between success of children in the performance of certain motor tasks and motor creativity manifestation (fluency), it can be concluded that the system of positive influences on physical activity can have a decisive role, both in the development of motor performance and in the development of motor creativity. It is assumed that the mentioned features complement each other, especially in the situations when children are faced with a motor problem of coordination nature. Consequently, during the period of childhood, educators and parents should strive to provide all children with suitable conditions in order to ensure optimal development of movement skills and opportunities for the esxpression of motor creativity. Motor activities of problem-solving and coordination character should be a part of work with preschool children. The task imposes itself as an imperative, having in mind that creative behaviour is in the basis of the development of the overall child's potential, human self-actualization and general progress (Perić & Tišma, 2014; Šefer, 2000, 2005; Sturza Milić, 2009b, 2011). It is therefore necessary to ensure "enriched" environment, meaning the adults should provide interesting, versatile and encouraging setting for a child, offering challenges and rising the standards of his/her success. What is also essential is that learning setting should be complex, provocative and rich with learning opportunities, abundance and variety of equipment and requisites. The gradual increase of motor contents complexity should also be ensured addressing various developmental fields at early age. The adults who are "curious" and willing to comprehend the ways children perceive, understand and represent the world are also needed.

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UTJECAJ MOTORIČKOG ISKUSTVA NA MOTORIČKU KREATIVNOST (FLUENTNOST) PREDŠKOLSKE DJECE

Cilj rada bio je razmotriti odnos između motoričke kreativnosti (fluentnosti) i motoričkog iskustva djece predškolske dobi. Prema suvremenim teorijama kreativnosti, iskustvo i znanje imaju važnu ulogu u formiranju kritične razine motoričkog znanja (ponašanja) ispod koje očitovanje kreativnosti nije moguće. Nedovoljno stimulirane i nerazvijene motoričke vještine i znanja u ovoj dobi mogu biti uzrokom smanjene ili „uspavane“ motoričke kreativnosti. Motoričke sposobnosti i znanja (motoričkim testiranjem pomoću standardizirane baterije od sedam motoričkih zadataka) i motorička kreativnost (Torrensov TCAM test) procijenjeni su u Vršcu na uzorku od 154 djece predškolske dobi od 6 do 6,5 godina. Rezultati pokazuju da su motorički uspješnija djeca postigla bolji rezultat u ispitnim zadacima TCAM-a. Dobiveni rezultati ukazuju na potrebu da se u radu s predškolskom djecom osiguraju odgovarajući uvjeti za optimalan motorički razvoj i motoričko kreativno izražavanje.

***Ključne riječi**: motoričko ponašanje, divergentna produkcija*

Correspondence to:
Nataša Sturza Milić, Ph.D.
Gudurički put 233
26300 Vršac, Serbia
Phone: +39160561 39 51
E-mail: natasasturza@gmail.com