



THE EFFECTS OF PLAYGROUND ACTIVITIES AND EXERCISING ON PLAYGROUND EQUIPMENT ON THE MOTOR COORDINATION OF PRESCHOOL CHILDREN

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INTRODUCTION

Play is an activity that has no other purpose than to produce satisfaction (Nykysuomen sanakirja [The Dictionary of Contemporary Finnish]). Play is a voluntary, separate, unanticipated, unproductive, normal and imaginative activity that differs from the rest of ordinary life (Caillois 1958). Play is an objective in itself but it is also a means. Play supports the entire development of a child – physically, cognitively, socially and emotionally (Rogers 1990, 43). Many children's games set demands on both basic motor and coordination skills; a child has to know how to adapt his or her own movement to the movement of others in terms of time and place and be able to coordinate his or her functions of observation and movement (Ruoppila 1995, 38). The aim of this study is to assess the effects of play-like exercise on motor coordination and in addition to evaluate the reliability and usability of different tests when assessing the motor coordination of children under school age.

METHODS

Preschool children (N=27) from four kindergartens (Vekararanta, Vekararinne, Vekarakylä, Vekarakolo) in the Rovaniemi City and Rovaniemi Rural District areas exercised regularly, as part of the normal physical education provided by the kindergartens, either daily (n=16) or twice a week (n=11) over a ten-week period in the autumn of 2003 on play and balancing equipment supplied to the kindergartens. The kindergartens rotated the equipment among themselves at intervals of two weeks. In the spring of 2004, all the preschoolers spent 1 h/week over a ten-week period in guided play at an indoor playground built by the Lappset Group Ltd.

The initial measurements (September 2003), intermediate measurements (December 2003) and final measurements (April 2004) included the following tests: height, weight, body composition (Inbody), 10-metre running time (photozell timing), volleyball throw (flight time with photocell timing), hand compression force (Newtest), accelerated stretch jump height, and two tests of the Movement ABC test battery: threading beads and one-leg balance (Henderson, Sudgen 1992). The initial measurements included additional four Movement ABC tests, but these tests were omitted from the intermediate and final measurements.

The intermediate and final measurements also included tests on performance speed on the motor coordination track at the Lappset playground; the test group performed one extra measurement on motor track between the intermediate and final measurements. The final measurements included also a 10-metre slalom run (with four posts to pass on the left and right alternately). In addition, the kindergarten teachers observed the children's motor coordination and basic motor skills using a Movement ABC checklist. Initial and final measurements were performed on a control group that consisted of preschool children (N=20) from one kindergarten in the city of Rovaniemi (Katajaranta 2). The preschoolers from one kindergarten of Rovaniemi Rural District (Saarenputaa) formed the control group (N=19) for Movement ABC check list observations. This kindergarten was concurrently a test group for another study, where the reliability of Movement ABC test battery was evaluated (Savikoski & Nissilä 2004). The measurement results were fed into the SPSS application and a correlation coefficient, t-test, unidirectional variance and regression analysis were used as the statistical methods.

RESULTS

There were no significant differences in the results of the intermediate measurements between the group which exercised daily and the group which exercised twice a week with the movable play and balancing objects during the autumn period.

There were no statistically significant differences in the results of any of the measured variables between the test and control group either in the initial or the final measurements. The test group improved their results significantly in motor track time (p<.001), hand compression forces (p=.014), 10-metre running time (p<.001), one-leg balance time (p=.002) and Movement ABC check list score (p<.001) between the initial and the final measurements. Comparably the control group improved significantly their results in accelerated stretch jump (p=.015), hand compression forces (p=.008), threading beads (p=.044) and Movement ABC check list score (p<.001).

When comparing the changes/improvements from autumn to spring, the test group improved their results more in 10-metre running time (p=.001) compared to the control group. The control group improved their stretch jump results (p=.006) and the Movement ABC check list score (p<.001) more than the test group. The test group also improved their motor track and one-leg balance times more than the control group, although these differences were not statistically significant. (Table 1)

To find out during which period the improvements occurred, the results of the initial/ first, intermediate/ second and final/ third measurements of the test group were compared with each other. The motor track time improved more between the first and second attempt (p=.003) than between the second and third. The accelerated stretch jump results improved during the autumn period, but worsened a little during the winter time (p=.006), while the results of threading beads worsened during the autumn, but got better during the winter (p=.008).

The t-test results and examination of the scatter diagrams suggest that more repetitive tests would be mainly the performance of maximum power or speed tests (motor track, the 10-metre run, throwing the volleyball, hand compression, stretch jump and threading beads). This observation supports Schmidt's (1988, 296) research results into the effect of increased speed of unidirectional movement on improved accuracy of timing and the repetitiveness of performance. The variation in the Movement ABC test results is particularly great in boys. This may be caused by the performance motivation, concentration, and attentiveness required by the tests.

Table 1. The comparison of the changes in the test results of the test and control groups between the initial and final measurement.

	Group	N	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed) t-test
Change in height (cm)	Test	27	3.96	0.787	0.151	
	Control	20	4.05	0.686	0.154	
Change in weight (kg)	Test	27	1.59	0.990	0.192	p=.298
	Control	20	1.88	0.804	0.180	
Change in muscle mass (kg)	Test	27	1.37	0.758	0.146	p=.854
	Control	20	1.41	0.614	0.137	
Change in body fat percentage	Test	27	-0.67	2.801	0.539	p=.208
	Control	20	0.34	2.495	0.558	
Change in motor track time (sec)	Test	27	-13.54	18.767	3.612	p=.111
	Control	19	-6.26	11.492	2.637	
Change in one-leg balance (sec) (both legs)	Test	27	3.09	4.668	0.898	p=.160
	Control	20	1.25	3.919	0.876	
Change in hand compression (kg) (both hands)	Test	27	1.11	2.191	0.422	p=.699
	Control	20	1.35	2.033	0.455	
Change in volleyball throw time (sec)	Test	27	-0.02	0.493	0.105	p=.458
	Control	17	-0.13	0.436	0.106	
Change in stretch jump height (cm)	Test	27	-1.53	5.214	1.004	p=.006
	Control	20	2.69	4.510	1.008	
Change in 10-metre running time(sec)	Test	27	-0.16	0.160	0.031	p=.001
	Control	20	0.01	0.171	0.038	
Change in time of threading beads (sec)	Test	27	-3.84	9.901	1.905	p=.928
	Control	20	-4.09	8.486	1.898	
Change in Movement ABC check list score	Test	27	-5.50	5.059	0.956	p<.001
	Control	19	-14.84	7.904	1.813	

DISCUSSION/CONCLUSIONS

The results indicated those tests that might be worthwhile using to measure children's motor coordination. The factors of fitness and motor control (Nupponen 1997) form the ends of the continuum that describe mobility. From the perspective of motor coordination measurement, it is probably impossible to exclude either one; the test results are affected by both the characteristics of physical fitness and know-how in performance technique. Observations offer a substantial alternative for field and laboratory tests especially when assessing motor behavior of children for a longer period of time. Observations can be subjective and therefore not totally comparable.

The improvements in a novel motor task (e.g. motor track) might mostly be due to learning and not due to the changes in physical fitness. Furthermore, with respect to small children, emotional and social factors should always be borne in mind: for example, the factors related to situation-specific attentiveness must not affect the results too much. The children in this age (6-7 years old) are maturing physically in such a pace that the maturation can also improve tests results without any specific training or learning.

The effects of playground activities and exercising on playground equipment seem to be small in this kind of a test setting where both groups are highly active anyway: according to the results of the questionnaires to the parents of the preschoolers (Karvonen 2004) and to the kindergarten teachers the children play and exercise indoors and outdoors approximately 4-7 hours a day (including free and instructed play & physical education & leisure time activities). All of the kindergartens in this study have a good or moderate playground of their own and/or there's a well-equipped playground near the kindergarten. All the kindergartens have indoor facilities for physical play and exercise and their weekly schedule include regular physical education. Thus, one hour of additional playground activity might not be enough to produce measurable effects on motor coordination and physical fitness.

The seasons are different in Finland, which is both an opportunity and a threat to motor coordination training of the Finns. The seasonal differences can also be seen in the variety of outdoor activities the Finns take part in. This might partly explain the loss of maximal force of the lower extremities found in this study and in our previous study (Hämäläinen & Pahtaja 2003).

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