EXAMINING THE EFFECT OF PSYCHOMOTOR TRAINING ON THE
COORDINATION, AGILITY AND BALANCE IN 10-11 YEAR-OLD
GIRLS ¹10-11 YAŞ KIZ ÇOCUKLARINDA PSİKOMOTOR ANTRENMANIN
KOORDİNASYON ÇEVİKLİK VE DENGİ ÜZERİNE ETKİSİNİN
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Öz: Bu çalışma, Araştırmacılar tarafından planlanan psiko motor antrenmanın, 10-11 yaşındaki kız çocuklarında koordinasyon, çeviklik ve denge üzerine etkisinin incelenmesi amacıyla yapılmıştır. Antrenman 8 hafta ve her haftada 3 gün 40dk'lık süreyle yapılmıştır. Çalışmaya Ankara Sincan Hacı Bektaş-ı Veli Ortaokulu'nda öğrenim gören ve testlerin yapılmasına engel olabilecek akut veya kronik herhangi bir hastalığı olmayan, 10-11 yaşındaki 5.sınıf kız öğrencilerinden 30 kişi çalışma (deney) grubu ve 31 kişi kontrol grubu olmak üzere toplam 61 kız öğrenci gönüllü olarak katılmıştır. İlk başta deney ve kontrol gruplarına koordinasyon, çeviklik ve denge becerilerinin ön testleri uygulanmış, deney grubuna 8 haftalık psikomotor antrenmandan yaptırdıktan sonra son testler uygulanmıştır. Psikomotor antrenmanın koordinasyon, denge ve çeviklik üzerinde olan etkisini belirlemek için kontrol ve deney gruplarında yapılan ön test ve son test ölçme sonuçlarının arasındaki farklara bakılmıştır. Verilerin analizinde SPSS 22 programından yararlanılmış, kontrol ve deney grupları arasındaki farklılıkların değerlendirilmesinde General Linear Model, Multivariate (MANOVA) analizi kullanılmıştır. Deney grubu örneklemelerinde denge ($p<0.01$), çeviklik ($p<0.01$) ve koordinasyon ($p<0.01$) ön ve son testlerin arasında istatistiksel olarak anlamlı fark olduğu gözlenmiştir. Kontrol grubu örneklemelerinde ise, denge ($p>0.05$), çeviklik ($p>0.05$) ve koordinasyon ($p>0.05$) ön ve son testlerin arasında istatistiksel olarak anlamlı fark olmadığı gözlenmiştir. Sonuç olarak, 8 hafta boyunca haftada 3 kez 40'ar dakikalık, denge duruşlarını, farklı tempo, kuvvet ve pozisyonlarla farklı yönlerde yapılan hareketleri içeren psiko-motor antrenmanın denge, çeviklik ve koordinasyon üzerinde oldukça olumlu etkisinin olduğu ve bu becerileri geliştirdiği görülmüştür.

Anahtar Kelimeler: Psikomotor Antrenman, Motor Beceriler, Zihinsel Beceriler

Abstract: This study was conducted by the researchers with the aim to examine the influence of 10-11 year-old girls' psychomotor training on coordination, agility and balance. The training was done for 40 minutes, 3 times a week and lasted 8 weeks. 61 10-11 year-old 5th grade female students who did not have any acute and chronic illnesses at Ankara SincanHaciBektas-iVeli Secondary School participated in the study (experiment) group; 31 of them, in control group. Firstly, study and control groups were applied pre-tests of coordination, agility and balance; then post-test was applied on the study group after the 8-week psychomotor training. To define the influence of psychomotor training on coordination, agility and balance, the difference between the pre and post-tests that were applied on the study and control groups were examined. SPSS 22 program was used to analyze the data; and Linear Model, Multivariate (MANOVA) analysis was used to assess the difference between the control and study groups. In the study group samples, it was observed that there was a statistically significant difference between balance ($p>0.05$), agility ($p<0.01$) and coordination ($p<0.01$) pre and post-tests. In control group samples, it was observed that there was not any statistically significant difference between the balance ($p>0.05$), agility ($p>0.05$) and coordination ($p>0.05$) pre and post-tests. As a result, it was seen that 40-minute-long psychomotor training which was done 3 times a week during 8 weeks and included balance stands, moves with different tempo, force, positions and directions had quite important influence on balance, agility and coordination and improved these skills.

Key Words: Psychomotor training, Motor Skills, Mental Skills

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INTRODUCTION

The word “psychomotor” precisely means “movement.” Every individual starts developing physically in mother’s womb. When they are born, this development quickens and continues. While some of the movements which were previously reflexes continue as such; by conscious usage of the organs, some transform into psychomotor abilities. Psychomotor development is described as the process of taking the behaviors which emerge in lifelong psychomotor abilities under control. The said behaviors occur with the cooperative work of sense organs, mind and muscles (Milli Eğitim Bakanlığı, Psikomotor Gelişim, 2007: 3).

The child gaining force and speed in using his or her arm, legs and all organs, coordinating the body organs and being skillful at controlling them is called kinetic; namely psychomotor development. This development goes hand in hand with physical development and enables one to comply with the environment. It plays an important role in the individual’s development as a whole (Yeşil yaprak, 2006: 3:61). Psychomotor development follows a regular line from head to toe, from inside (center) out and from large muscles to small muscles (Milli Eğitim Bakanlığı, Psikomotor Gelişim, 2007: 3-4).

Terms of motor development and psychomotor development are often substituted. Psycho-

motor development examines an individual’s lifelong locomotor behavior from prenatal period. Motor development involves children’s development of locomotor and physical abilities (Yalçın, 2007: 4-5).

Carrying out consecutive multiple movements with various directions, tempo and force constitutes the psychomotor training (Rintala, Pi-enimaki, Ahonen, Cantell and Kooistr, 1998: 721-737). It is known that psychomotor training has an effect on developing basic motor abilities.

Bompa defined the ability of coordination as “The Notion of Sports or Sports Intelligence” (Bompa, 2011: 365).

Oswald, Rupprecht, Gunzelmann and Tritt (1996: 67-72) stated that there is a positive correlation between the development of coordination abilities and psychomotor training.

Balance, which is an important psychomotor ability is maintaining the center gravity of the body on the vertical support bar (Hrysomallis, 2011: 221-232).

According to Marius (2012: 496-501), balance is a crucial component in maintaining the body in different positions during the application of motor ability groups. Balance is examined in two sub-categories; static balance and dynamic balance. While static balance is described as the ability to maintain the

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body's balance on a specific point or position, or the ability to control the postural oscillation while standing in motionless position, dynamic balance is the ability to balance the body while moving (Duncan, 1990: 192-7).

It can be said that balance ability is a parameter which greatly affects the coordination ability. Balance ability has an important part especially during the applications of agility which is one of the parameters that affect the coordination ability (Kaya, 2015: 15).

Hazar (2005: 148) defines agility as the quick application of a skill.

Quality of agility requires the cooperation of speed, balance, force and coordination. Agility, which is a motor skill, can be developed with regular progressive exercise (Karacabey, 2013: 1693-1704).

Coordination, agility and balance are not only motor, but also psychological parameters and it is known that these factors are related to psychomotor training (Oswald et al., 1996: 67-72).

Jogging and running by switching direction and speed, climbing, balance movements, jumps and rotations, coordination, balance and agility movements which are done by combining a number of movements, passing under or over the obstacles increase the quality and level of motor features; and at the

same time, increase the psychological factors' level such as making quick decisions, combining complex movements, being creative in unusual circumstances and choosing the most logical solution (Rintala et al., 1998: 721-737).

Coordination, agility and balance are considered as crucial motoric and psychological factors in creating the movement series techniques in a lot of sports branch and applying them with better and higher performance.

Therefore, the influence of 10-11 year-old girls' psychomotor training on coordination, agility and balance which are among the motoric skills is examined and the findings gathered from the data, discussion, conclusion and suggestions are displayed.

MATERIALS and METHOD

Research Design

In this study, pre-test post-test from the experimental techniques was used with the control group model and the study has an experimental qualification.

As per the participants, a total amount of 61 female students voluntarily participated in the study, while they studied in the 5th grade at the HacıBektas-iVeli Middle-school in Ankara, Turkey, with their ages varying between 10-11, and they were divided into 2 groups, where 30 of them were placed into the ex-

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perimental group and 31 were placed into the control group. The students who participated in the study showed no signs of any acute or chronic illnesses while appropriate permissions were taken from their families.

Firstly, the necessary information was explained to the participants regarding the Coordination, Agility and Flamingo balance tests and the tests were applied to the students and the results were noted. Afterwards, coordination, agility and balance-developing psychomotor training exercises were applied to the participants in the experimental group three times a week for 8 weeks and with the duration of 40 minutes each time. On the other hand, no training schedule was applied to the control group. In the end of this time period, the same tests were applied to the control and experimental groups and the differences between the pre-test post-test results were noted.

The training applied in our study includes balance walking, shuttle run, plyometric exercises, passing under and over obstacles, turns, changing speed and direction while running, forwards and backwards somersault and standing in balance positions such as glider.

Rintala, Pienimäki, Ahonen, Cantell and Kooistra (1998: 721-737) similarly applied general motor movements, ball skills (move-

ments conducted with a ball) and movements applied in unusual situations, which equated into a 3 dimensional psychomotor training program. The content of the training consisted of movements such as walking and running while changing direction and speed, climbing, jumping on a trampoline, rhythmic capriole on the floor, capriole with a rope, dynamic balance, jumping towards an aim, jumping with a ball and turning and going under obstacles after jumping (Rintala et al., 1998: 721-737).

Applied Tests

Coordination Test

Forwards and backwards somersault: The participant is requested to perform quick somersaults forwards and backwards.

Passing Through Obstacles: The participant passes through 2 obstacles which are 50 cm in height, as fast as they can, while passing under the first obstacle and over the second one. In cases where these exercises are not performed correctly, the participant is requested to re-do the exercises.

Walking on the Balancing Beam: The participant starts the exercise by stepping on one of the steps which is 20 cm high while the balancing beam itself is 4 m in length and 52,5 m in height. The participant walks and runs on the balancing beam until they reach the end.

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Steps on a 20 cm step again while getting off of the beam. In case the participant falls, they begin again starting at the point where they fell.

5 Capriole with both legs to the left and right on a bank: Performing 5 capriole in a row with both legs while jumping over the obstacle which is 40 cm in height, 20 in width and 120 cm in in length without knocking the obstacle over. In case the bank is knocked over, it is put back up and the participant continues from where they left off.

Carrying a basketball: The participant takes three basketballs from one of the two frames that are 10 cm in height and 1 square meter in size, and carries them to the other frame located 4 meters away from the first frame. In case the basketballs fall out of the frames, they get put back into the frames.

Slalom: The participant performs a criss-cross between 4 slalom poles.

Sprinting (7m): The distance between the slalom poles and the finish line, which is 7 meters, is sprinted and the station is completed. The time spent in these stations are recorded through the stopwatch at the finish line.

Scoring: The best performance receives (40) points. The participants' scores are listed with a scoring system of (2) where they are scored accordingly from the top performance to bot-

tom. Similar use of the coordination test was described in the single-stage judo exercise. (Tekasamali judo sinavtalimati, 2015: 1-6).

Flamingo Balance Test (Standing in Balance on the Beam on One Leg)

A wooden or metal beam which is 45 cm long, 5 cm high and 4 cm wide sitting fixatedly on two support pieces which are 15 cm long and 4 cm wide is needed in order to apply this test.

The participant attempts to stand in balance on the flamingo balancing beam for 1 minute on one leg without falling. The participant bends their leg behind which is not on the beam while holding their leg from the foot with the hand on the same side and standing on the beam on one leg like a flamingo. They may however take some support from the arm of the assistant with their other hand while trying to come to the balance point. Upon balancing on the beam, the participant says that they are ready and takes their arm off of the assistant. The test begins as soon as they let go of the assistant's arm. In this case, the participant needs to attempt to keep their balance for 1 minute. The test will be stopped every time the balance fails. For example, the participant letting go of the leg they were holding, or touching the ground with any other part of their body will disrupt the balance. After every pause, the application is re-

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started and continues until the 1-minute mark is reached. Sozen (2012: 1455-1460) applied a similar Flamingo Balancing in their study. A similar flamingo balancing test was used in the single stage judo examination instruction (Tekasamali judo sinavtalimati, 2015: 1-6).

Agility Test

Two cones are placed on a flat surface with a distance of 15 meters between them. The participant waits readily near the first cone while their feet should not be past the cone. They run to the other cone as fast as possible upon receiving the signal (i.e. whistle). They slow down when they reach the cone, touch the cone and turn around. This run is repeated 5 times and the test is finished on the other side of the cone at the starting position. The clock starts ticking when the participant lifts their foot and the stopwatch is stopped and the time is noted when any part of the participant passes the finish line (line which is positioned

perpendicularly on the ground). The measurement of the test is performed by the milliseconds (Mark D. Sleeper, Lisa K. Kenyon & Ellen Casey, 2012: 124-138).

Data Analysis

SPSS 22 software was used in the analysis of the data. General Linear Model, Multivariate (MANOVA) analysis was used in the evaluation of the differences between the results gathered from the control and experimental groups regarding the effects of the coordination, agility and balance improving psychomotor training that was applied to the 10-11 year-old female students 3 times a week for 8 weeks, over the coordination, agility and balance skills of the participants.

FINDINGS

The differences between the pre and post-tests of the students.

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Table 1. The Differences Between the Pre and Post-Tests in the Experimental Group

Source	Dependent Variable	Type III Sum of Squares	df	Means		Mean Square	F	Sig.	Partial Eta Squared
				Pre	Post				
Experimental Group	Balance	112,06	1	4,59	1,98	112,06	11,899	,001**	,157
	Agility	31,40	1	23,93	22,55	31,40	16,165	,000**	,202
	Coordination	1565,70	1	47,09	37,35	1565,70	69,806	,000**	,522
Error	Balance	602,71	64			9,417			
	Agility	124,35	64			1,943			
	Coordination	1435,47	64			22,429			
Total	Balance	1429,30	66						
	Agility	35804,67	66						
	Coordination	120649,85	66						
Wilks' Lambda of the pre-test and post-test		F	df			Error df	Sig.	Value	
		24,579 ^b	3,0			62,00	,00	.457	.543

****p< 0.00, *p< 0.05**

When Table 1 is examined, Wilk's $\Lambda=.457$, $F(3,62)= 24,57$, $p= .00$, partial $\eta^2 =.543$. Statistically significant differences were observed between the balance pre and post-tests in the experimental group samples $F(1,64) = 11,899$, $p. 001$, partial $\eta^2 = .157$, (4,59), (1,98).

Statistically significant differences were observed between the agility pre and post-tests

in the experimental group samples $F(1,64) = 16,165$, $p .000$, partial $\eta^2 = .202$, (23,93), (22,55).

Statistically significant differences were observed between the coordination pre and post-tests in the experimental group samples $F(1,64) = 69,806$, $p .000$, partial $\eta^2 = .522$, (47,09), (37,35).

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Table 2. Differences Between the Control Group Pre and Post-Tests

Source	Dependent-Variable	Type III Sum of Squares	df	Means		MeanSquare	F	Sig.	Partial Eta Squared
				Pre	Post				
Experimental Group	Balance	11,87	1	4.54	3.69	11,879	,999	,321	,015
	Agility	3,87	1	24.45	23.97	3,874	1,778	,187	,027
	Coordination	186,34	1	49.25	45.89	186,346	4,379	,040	,064
Error	Balance	761,15	64			11,893			
	Agility	139,47	64			2,179			
	Coordination	2723,61	64			42,556			
Total	Balance	1894,00	66						
	Agility	38847,39	66						
	Coordination	152288,31	66						
Wilks' Lambda of the pre-test and post-test		F	df			Error df	Sig.	Value	
		1.721 ^b	3,0			62,00	.172	.923	.077

****p< 0.00, *p< 0.05**

When Table 2 is examined, Wilk's $\Lambda = .923$, $F(3,62) = 1,721$, $p = .172$, partial $\eta^2 = .077$.

No statistically significant differences were found between the balance pre and post-tests in the control group samples $F(1,64) = ,999$, $p .321$, partial $\eta^2 = .015$, (4,54), (3,69).

No statistically significant differences were found between the agility pre and post-tests in the control group samples $F(1,64) = 1,778$, $p .187$, partial $\eta^2 = .027$, (24,45), (23,97).

No statistically significant differences were found between the coordination pre and post-tests in the control group samples $F(1,64) = 4,379$, $p .040$, partial $\eta^2 = .064$, (49,25), (45,89).

Upon the examination of the tables, statistically significant differences were found between the control and experimental groups regarding the balance, agility and coordination tests.

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DISCUSSION and RESULT

The purpose of this study is to examine the effects of the psychomotor training, which was applied to the 10-11 year old female students 3 times a week (40 min.) during 8 weeks, on the basic motoric skills: coordination, agility and balance.

When the effects of psychomotor training on the balance was taken into consideration, a statistically significant difference was found between pre-test ($\bar{x}$ 4,59) and post-test ($\bar{x}$ 1.98) in the training group (experimental group) ($p < 0.01$). No statistically significant difference was found between the balance pre-test ($\bar{x}$ 4,54) and post-test ($\bar{x}$ 3,69) in the non-training group (control group) ($p < 0.05$). This result reveals that the psychomotor training that was applied improves the balance significantly. The findings show similarities with the results of Şen's study which they conducted with the aim of defining the physical education studies' effects on pre-school children. The results of the study which included the content of the program being prepared as supporting the motor development of the children reveals that the steady long jump, run and dynamic balance performances, the values of the experimental group were found to be high (Şen, 2004:1-112). Similarly, in another conducted study the results revealed that improving the balance skill is performed through psychomo-

tor training and is related to motor skills such as walking, running, jumping, climbing speeding up etc. (Hazar and Taşmektepligil, 2008: 9-12).

When the effect of psychomotor training over the agility is examined, a statistically significant difference was found in the experimental group between the pre-test ($\bar{x}$ 23,93) and post-test ($\bar{x}$ 22,55) ($p < 0.01$). In the control group however, no significant difference was found between the pre-test ($\bar{x}$ 24,45) and post-test ($\bar{x}$ 23,97) results ($p > 0,05$). The findings point out that the training that was applied increases the agility significantly. Performing different and complicated exercises, applied in the form of station, simultaneously and repeatedly is thought to be empowering the brain while affecting the reaction and movement time positively, therefore ensuring the changing of direction and pace to be quicker (Bompa and Haff, 2015: 109; Hazar and Taşmektepligil, 2008: 9-12). Due to the fact that the training program applied in this study also included such exercises, the fact that agility is developed further in the training group may thought to be an expected result.

On the other hand, when the psychomotor training's effects on coordination is examined, a statistically significant difference was found between the pre-test ($\bar{x}$ 47,09) and post-test ($\bar{x}$ 37,35) results in the Coordination

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dination test ($p < 0,01$). In the control group however, no significant difference was found between the pre-test ($\bar{x}$ 49,25) and post-test ($\bar{x}$ 45,89) results ($p > 0,05$). Result shows parallelism with the results of Milaim et al., (2016) study “Examination on the Effect of the Psychomotor Training Program on Certain Basic Motoric Properties in 20-Year-Old Men” ($p = 0.410$, $\bar{x} = 7.26$, agility $p = 0.466$, $\bar{x} = 17.23$), and coordination $p = 0.169$, $\bar{x} = 37.94$, $\bar{x} = 36.99$) (Milaim et al 2016:640-647).

These results reveal that the psychomotor training that was applied ensures the significant development of the coordination skill along the balance and agility skills. This result shows parallelism with the results of Oswald et al., (1996) study “The SIMA-project: effects of 1 year cognitive and psychomotor training on cognitive abilities of the elderly”. Oswald et al., determined that the Coordination skill is related to psychomotor training and the further development is ensured through psychomotor training (Oswald et al., 1996: 67-72).

As a result, psychomotor training which includes exercises such as balance walk, shuttle run, plyometric movements, passing under and over obstacles, turns, changes in direction and pace while running, standing in balance positions such as the glider, somersault's and other similar exercises, drastically improves the coordination, balance and agility, which

are from the basic motor skills, in 10-11 year-old female students.

SUGGESTIONS

Psychomotor skills is one of the important subjects in humans life. These skills do not affect the people only in the sportive sense, but also affects the movements of the people in their daily lives, therefore these skills which are earned since the first years of life are considered to be very important (Sheikh, Safania and Afshari, 2011: 1723-1725).

1. Adding more of the age-group appropriate exercises that will develop the basic motor skills of the students beginning from very young ages into the games in preschool, or games and activities in Physical education and sports lessons can be suggested.
2. Exercises developing the coordination, balance and agility skills can be suggested to take a major part in the training programs due to the fact that the development of coordination, balance and agility skills is very effective in reaching the maximum performance in many sports branches.
3. This study can be conducted with male's and people from different age groups.

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