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Araştırma Makalesi

THE EFFECT OF CALISTHENICS EXERCISES OF PERFORMED ON STABLE AND UNSTABLE GROUND ON BODY FAT PERCENTAGE AND PERFORMANCE IN SWIMMERS

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Abstract

The aim of this study was to investigate the effect of calisthenics exercise on body fat percentage and sportive performance in swimmers. 30 swimmers between 12 and 14 years of age participated in the study voluntarily. The participants were divided into 3 groups. In the first group, 10 swimmers performed calisthenics exercise on stable ground and (4-5 units) swimming training, in the second group 10 swimmers performed calisthenics exercise on unstable ground and (4-5 units) swimming training and in the third group 10 swimmers performed (4-5 units) swimming training. The study lasted 8 weeks, at least 7 hours a week. Height, body weight, body mass index, body fat percentage, flexibility, 30 meters speed, agility, back and leg strenght, crunch, push-ups and plank measurements were taken. Statistical analysis of the results was conducted in the IBM SPSS 19 package program. There were significant differences in flexibility, 30 meters speed, agility, back and leg strength, crunch, push-up and plank values at $p<0.05$ level. There is no significant difference in body fat percentage. Based on this data, it can be said that it will provide benefits in terms of health and performance gain in the implementation of regular calisthenics exercise three times a week, 60 minutes in each training unit and eight weeks and more. In addition, it is thought that providing the variety of exercise modes in the implementations in time (rope jumping, elastic bands, step, health balls) will provide benefits in terms of implementations.

Keywords: Swimming, calisthenics, body fat percentage, performance

YÜZÜCÜLERDE STABİL VE STABİL OLMAYAN ZEMİNDE YAPILAN KALİSTENİK EGZERSİZLERİN VÜCUT YAĞ ORANINA VE PERFORMANSA ETKİSİ

Özet

Bu çalışmanın amacı, yüzücü çocuklarda stabil ve stabil olmayan zeminde yapılan kalistenik egzersizlerin vücut yağ yüzdesine ve sportif performansa etkisini incelemektir. Çalışmaya yaşları 12-14 arasında olan 30 yüzücü gönüllü olarak katılmıştır. Çalışmaya katılan yüzücüler 3

gruba ayrılmıştır. Birinci grupta 10 yüzücü stabil zeminde kalistenik egzersiz ve (4-5 birim) yüzme antrenmanı, ikinci grupta 10 yüzücü çocuk stabil olmayan zeminde kalistenik egzersiz ve (4-5 birim) yüzme antrenmanı ve üçüncü grupta 10 yüzücü çocuk (4-5 birim) yüzme antrenmanı yapmıştır. Çalışma haftalık en az 7 saat olmak üzere toplamda 8 hafta sürmüştür. Araştırmada boy, vücut ağırlığı, beden kitle indeksi, vücut yağ yüzdesi, esneklik, 30 metre sürat, çeviklik, sırt ve bacak kuvveti, mekik, şınav ve plank ölçümleri alınmıştır. Elde edilen bulguların istatistiksel analizi IBM SPSS 19 paket programında yapılmıştır. Esneklik, 30 metre sürat, çeviklik, sırt ve bacak kuvveti, mekik, şınav ve plank değerlerinde $p<0,05$ düzeyinde anlamlı farklılıklar tespit edilmiştir. Vücut yağ yüzdesinde anlamlı bir farklılığa rastlanmamıştır. Bu verilere dayalı olarak düzenli kalistenik antrenmanın devamlılık prensibine göre haftada üç sıklıkla, her antrenman biriminde 60 dakika olmak üzere sekiz hafta ve üzeri uygulanmasında sağlık ve performans getirisi açısından faydalar sağlayacağı söylenebilir. Ayrıca, zaman içerisinde uygulamalarda antrenman modlarının çeşitliliğinin sağlanması (ip atlama, elastik bantlar, step, sağlık topları) uygulamalar açısından faydalar sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Yüzme, Kalistenik, vücut yağ yüzdesi, performans

1. INTRODUCTION

Regular sports activities during childhood period play an important role in the development and continuity of a healthy physical structure (Yüksel et al., 2013). Calisthenics exercise is a useful and beneficial exercise method that can be practised at different intensity and can also be modified (Baştuğ, 2007). It is possible to activate both small and large muscle groups with calisthenics exercises. Materials such as bosuball, TRX, pilates ball, elastic bands allow the application of core and calisthenics exercise on both stable and unstable grounds. Stable and unstable ground exercises cause muscle groups to participate in different rates of movement. In exercises on unstable ground, the tension duration of the muscle is long and the speed of movement is low. With the application of the same movement on different grounds, the muscles involved in the movement produce different amounts of strenght. This allows the muscles to function in coordination not just regional but in many regions (leg-hip-body) (Otman, 2012; Egesoy et al., 2018).

Core and calisthenics exercises consist of movements that increase the flexibility and strength of the body. It also increases muscle endurance and cardiovascular fitness levels. They develop psychomotor skills and coordination, such as balance (Staud et al., 2001). The development of proprioception and coordination can be achieved with the activation of different muscle groups. For this reason, calisthenics exercise is a form of exercise that is frequently used in both rehabilitation and sports training. Calcistenic exercises are short muscle contractions that occur by using body weight in motion to increase body strength and flexibility. For example, many movements such as flexion, jumping, shaking and bending may affect every muscle group in the body that concerns arms, legs, body, neck, back.

Calisthenics exercises are discussed in the literature in different populations due to their various central and peripheral effects (Ozer Kaya et al., 2012).

The effects of exercise on body flexibility, body composition (Çakır and Şenel, 2017), MaxVO2 (Uludağ, 2005; Karacan, 2010), flexibility, anaerobic power, aerobic capacity, leg strenght (Türkoğlu, 1993), power, flexibility, blood pressure, resting pulse (Çolakoğlu, 2008), total cholesterol, triglycerides, systolic-diastolic blood pressure and decrease in obesity rates (Staud et al., 2001) were determined.

It also reduces the negative effects of fatigue, insomnia, difficulty concentrating and depression (Karacan, 2010). Regular exercise has an important role in obesity, hyperglycemia, LDL, blood pressure. Cardiovascular output and blood flow to working muscles are increasing throughout physical activity (Staud et al., 2001). In addition, simple motor skills have an impact on performance (Çakır et al., 2016).

2. PURPOSE OF RESEARCH

The aim of this study is to investigate the effect of calisthenicals exercise on body fat percentage and sportive performance in swimmers.

3. METHOD

3.1. Working Design and Participants

The study consisted of swimming athletes who actively participated in competitions in the swimming branch and practiced for 7 hours per week (4-5 units) in accordance with the training plan. The subjects were determined by the approval of their parents and coaches that there were no injuries that could affect the study during or before the study. 30 swimmers between 12 and 14 years of age participated in the study voluntarily. The participants were divided into 3 groups. In the first group, 10 swimmers performed calisthenics exercise on stable ground and (4-5 units) swimming training, 10 swimmers performed on unstable ground and (4-5 units) swimming training and 10 swimmers (4-5 units) swimming training in the third group. The study lasted 8 weeks, at least 7 hours a week.

3.2. Applied Tests

In the study, height, body weight, body mass index (Sever, 2013), body fat percentage (Zorba, 2013), flexibility (Muyor et al., 2014), speed of 30 meters (Tanner and Gore, 2012), agility (Harman et al., 2000), back and leg strength (Zorba and Saygin, 2017), crunch (Esco et al., 2008), push-up (Norton and Olds, 1996), and plank (Barwick et al., 2012). measurements were taken. Table 1 shows the norms used throughout the training period.

Table 1. Training Program

The severity of exercise	Maximal average 25% of plank and bridge %30-%67 of crunch ve oblique crunch movements
Cover of exercise	3 days per week/20 min per day 30 units in 10 weeks.
Set/back	3set/15-25 back, 3 set /30-40 sec
Resting time	1 minute rest between set

3.3. Data Analysis

Statistical analysis of the results was performed in the IBM SPSS 19 package program. Identifying information for all groups is consolidated. The first test distribution of variables according to groups was investigated and the normality of distributions and homogeneity of variance were determined by the Mauchly' Sphericity Test and Levene Test. Analysis of the effects of intra and intra-group training was carried out with multiple variation analysis (MANOVA) in repeated measurements. Post Hoc comparisons were determined using the Bonferroni Test. The degree of significance was accepted as 0.05.

4. RESULT

Table 2. Age and Height, Weight, BMI Values of the Groups

	Groups	**N**	$\bar{X}$ **±SD**	**Minimum**	**Maximum**
Age	Unstable	10	12,70±0,67	12,00	14,00
	Stable	10	13,20±0,91	12,00	14,00
	Control	10	13,00±0,81	12,00	14,00
Height	Unstable	10	1,45±0,06	1,38	1,55
	Stable	10	1,44±0,05	1,37	1,52
	Control	10	1,41±0,04	1,35	1,49
Weight	Unstable	10	37,40±3,23	35,00	45,00
	Stable	10	37,20±6,59	29,00	52,00
	Control	10	37,50±5,35	28,00	43,00
BMI	Unstable	10	18,64±1,24	16,65	20,54
	Stable	10	17,86±2,28	14,88	22,51
	Control	10	18,11±1,77	15,36	20,25

The mean age of the children who exercise on unstable ground was 12.70±0.67, the mean height was 1.45±0.06, the mean body weight was 37.40±3.23 and the mean body mass index was 18.64±1.24. The mean age of the children who exercise on stable ground was 13.20±0.91, the mean height was 1.44±0.05, the body weight was 37.20±6.59 and the BMI was 17.86±2.28. The mean age of the control group was 13,00±0,81, mean height was 1,41±0,04, body weight was 37,20±6,59 and BMI was 18,11±1,77.

Table 3. Comparison of Body Fat Percentage and Performance Tests between Groups

	Groups	**N**	**Pre-Test** $\bar{X}$ **±SS**	**Post-Test** $\bar{X}$ **±SS**	**Intra-group Change (%)**	**Group F**	**p**
Body Fat Percentage	Unstable	10	9,23±0,96	9,18±0,90	-0,05(0,54)	1,398	0,264
	Stable	10	9,33±1,05	9,31±1,01	-0,02(0,21)		
	Control	10	9,25±1,49	9,29±1,39	0,04(0,43)		
Leg strength	Unstable	10	81,40±6,76	83,70±6,84	**2,30(2,82)***	23,326*	**0,000**
	Stable	10	80,10±7,53	82,50±6,65	**2,40(2,99)***		
	Control	10	80,90±5,85	82,00±5,69	1,10(1,35)		
Back strength	Unstable	10	86,00±6,03	90,50±5,66	**4,50(5,23)***	14,107*	**0,000**
	Stable	10	82,10±5,38	86,40±4,76	**4,30(5,23)***		
	Control	10	84,20±3,55	85,90±3,28	1,70(2,01)		
Flexibility	Unstable	10	25,50±4,52	29,00±4,05	**3,50(13,72)***	16,939*	**0,000**
	Stable	10	25,40±3,86	27,20±3,67	**1,80(7,08)***		
	Control	10	26,60±3,68	27,40±3,77	0,80(3,00)		
Crunch	Unstable	10	38,90±5,89	45,70±5,86	**6,80(17,48)***	15,080*	**0,000**
	Stable	10	39,80±4,87	45,00±5,03	**5,20(13,06)***		
	Control	10	41,90±4,84	43,20±4,87	1,30(3,10)		
Push-up	Unstable	10	23,90±4,84	28,30±5,53	**4,40(18,41**)*	5,165*	**0,013**
	Stable	10	24,10±4,77	26,80±4,61	**2,70(11,20)***		
	Control	10	24,70±4,98	26,20±5,32	1,50(6,07)		
Plank	Unstable	10	51,80±4,31	60,10±4,20	**8,30(16,02)***	26,288*	**0,000**
	Stable	10	51,10±6,70	59,50±7,45	**8,40(16,43)***		
	Control	10	48,00±4,87	51,50±5,72	1,50(3,29)		
30 meters Speed	Unstable	10	4,83±0,17	4,78±0,16	**-0,05(1,03)***	4,983*	**0,014**
	Stable	10	4,79±0,10	4,75±0,10	**-0,04(0,83**)*		
	Control	10	4,84±0,09	4,82±0,09	-0,02(0,41)		
Agility	Unstable	10	5,84±0,10	5,77±0,08	**-0,07(1,19)***	7,569*	**0,002**
	Stable	10	5,84±0,09	5,81±0,09	-0,03(0,51)		
	Control	10	5,83±0,11	5,81±0,10	-0,02(0,34)		

$\bar{X}$: arithmetic mean, SD: standard deviation. (*p<0,05)

The results of the measurement of body fat percentage of the participants in the table are compared in terms of intergroup, intragroup and group*test relationship. There was no significant difference in body fat percentage in groups who do calisthenics exercises on stable and unstable ground. As a result of leg strength, back strength, flexibility, crunch, push-up, plank, speed of 30 meters and agility tests, positive increases were observed in children who exercise on stable and unstable ground. There is no statistical increase for the control group in crunch and plank tests. There was a significant increase in leg strength and plank values of the group who performed calisthenics exercise on stable ground. However, the group that exercises on the unstable ground shows a positive increase in the values of back strength,

crunch, push-ups, 30 meters of speed, agility and flexibility. Leg strength, back strength, flexibility, crunch and plank tests were all test*group interaction observed, while this interaction was due to the group development of stable and unstable groups. However, in push-up, 30-meter speed and agility tests there is a test*group interaction in the differences between groups caused by the unstable group.

5. DISCUSSION

In the age of growth and development, regardless of growth, the answer to the training has been an object of interest. Studies in this area obtained quite contradictory results (Rowland, 1985; Vaccaro and Mahon, 1987; Lemura et al., 1999; Acikada, 2004). As a result of the physical, functional and sexual development mentioned above, children react differently at almost any age. Children are not like adults in a miniaturized view. Unlike adults, if they respond well to aerobic activity, they also respond well to anaerobic activity (Lemura et al., 1999). It is not possible to predict what will happen at an advanced age, depending on the child's developmental characteristics (Rowland, 2000). Research shows that the responses of children to training loads are similar to adults. It was observed that the basic and auxiliary principles of training were also applicable in the training loads of children and young people (Harre, 1982) and the violence, frequency, volume or duration of overload were determined in the response to training (Ozmun et al., 1994). However, the intensity and frequency fluctuations in the training load applied to children and young people and the resulting form changes are less variable than adults (Bompa, 2000).

Anthropometric findings in the study include body fat percentage. There was no difference in the intraoperative pre-test and the post-test values of the control group with the subjects who performed calisthenics exercise on stable and non-stable ground. Correspondingly, there was no difference between the groups. It is observed that calisthenics exercise programs on stable and unstable grounds do not cause statistically significant changes in body composition of athletes. In the literature, there are few studies that show the effect of calisthenics exercise on body fat percentage. Studies reveal different results and the reason for the differences is thought to be the result of the groups of subjects.

Many studies (Vergili, 2012; Pinar, 2014; Colakoglu, 2008; Nindl, 2017; Kieres and Plowman, 1989; Mosher et al., 1998; Rogers and Gibson, 2009; Mehdizadeh, 2015; Noormohammadpour et al., 2012; Cruz-Ferreira et al., 2009) show that there are positive improvements as a result of calisthenics exercises. Some studies (Epstein, 1996; Kloubec, 2010, Segal et al., 2004; Kalaycioglu, 2012; Sekendiz et al., 2007) show that there is no statistically significant difference in calcific exercise. The effects of the studies performed on

sedentary people and athletes on body composition may be different. But it can be said that calisthenics exercise in general leads to positive body composition changes. This can be explained by the fact that the early adaptation of the organism to exercise is high.

Before and after the 8 week calisthenics exercise study, 8 tests were applied to stable, unstable and control groups. All tests except agility test show statistical improvement differences between pre-test and post-test values of both stable and unstable groups. In the agility test, there were differences between the pre-test and post-test in the group performing calisthenics exercise only on unstable ground. Test group interaction was observed in all tests of leg strength, back strength, flexibility, crunch, push-ups, plank, speed of 30 meters and agility. In the leg strength, the stable group developed the score more than in the unstable group. In the back strength, the unstable group's score was more developed than the stable group. While the unstable group in the value of flexibility improved its flexibility by 13.72%, the stable group developed by 7.08%. The values of the unstable group at crunch and push-up values are much better than the stable group. In the unstable group, the crunch score was 17.48% and the push-up score was 18.41%. The values of both the stable group and the unstable group are very close to each other for the plank score. However, the plank score of the group engaged in calisthenics exercise on the stable ground has more improved proportionally. It developed as 1.03% in the unstable group at 30 meters speed and 0.83% in the stable group. The agility score only showed statistically improvement in the unstable group. Although the stable group showed improvement, it did not differ statistically. It is thought that the development of 12-14 year-old swimmers in the control group appears to be due to the fact that the development of 12-14 year-old swimmers was the fastest.

In the study, it was observed that the groups who exercise on the stable and unstable ground increased the test values as a result of the calcistenical exercises. The results of calisthenics exercise and strength exercise show similar results in many studies. Responses to strength exercise before and after adolescence attracted the interest of many researchers. The mechanisms of responses to force increase, responses to non-training and risk of injury are among the subjects of force training in children (Açıkada, 2004). According to studies of Mosher et al. 1998; Ortega et al., 2002; Sekendiz et al., 2007; Emery, 2005; Capen, 1950; Ibis et al. 2004; Kurt et al., 2010; Harbili et al. 2005; Saygun et al. 2005, they stated that exercise programs for 8 to 12 weeks had positive effects on strength.

Findings from calisthenics exercise and flexibility exercise reveal the same result as many studies. In most studies, the results of the flexibility value are similar. In this study, the flexibility value of the group performing calcistenical exercise on unstable ground increase as

13.72% and the flexibility value of the group performing calcistenic exercise on stable ground increase as 7.08%. While the value of flexibility reveals positive differences in exercise groups, it usually results in a statistically significant difference in control groups. (Sekendiz et al., 2007; Ibiş et al., 2004; Kurt et al., 2010; Biçer et al., 2009; Ciğerci et al., 2011; Zorba and Ziyagil, 1998; Zorba et al., 2004; Dilber et al., 2016).

In the study, isotonic exercise such as crunch and push-up showed statistically positive improvement in both experimental groups. However, it was found that the scores of the subjects who do calisthenics exercise on unstable ground were better. It is observed that isometric exercise such as plank shows statistically improvement in both experimental groups. Although the development scores of both test groups are close together, the scores of the subjects who do calisthenics exercise on stable ground are higher. It is thought that the number of crunch, push-up and plank values show improvement in control groups as a result of the age range in which the development of the group is the fastest. It is known that positive improvements were made in push-up, crunch and plank scores as a result of exercise period in the literature. (Dilber et al., 2016; Sever, 2017; Folland et al., 2005; Weir et al., 1995; Parkhouse and Ball, 2011; Ahmadi et al., 2014; Cressey et al., 2007; Oliver and Di Brezzo, 2009; Schiffer et al., 2009).

There was a statistically significant difference between the pre-test and post-test values of both experimental groups at $p<0.05$ in 30 meters of speed. While the subjects who exercise on unstable ground showed 1.03% improvement, the subjects who exercise on stable ground showed 0.83% improvement. There was a significant difference between the pre-test and the post-test values of the subjects who did calisthenics exercise on unstable ground in agility values at $p<0.05$. Although there was no statistically significant difference between the subjects who exercised on stable ground and the control group. Subjects who exercise on unstable ground showed 1.19% improvement. Although many studies have shown that calcistenical exercise has little or no effect on functional tests (strength, throwing, jumping, agility, sprinting, aerobic capacity and power, etc.), some studies have shown that positive development in core exercises and core tests has contributed to many features. (Nesser et al., 2008; Okada et al., 2011; Sever, 2016; Willardson, 2007; Sever, 2017).

Based on these data, it can be said that it will provide benefits in terms of health and performance gain in the implementation of regular calisthenics exercise three times a week, 60 Minutes in each training unit and eight weeks and more. In addition, it is thought that providing the variety of training modes in the implementations in time (rope jumping, elastic bands, step, health balls) will provide benefits in terms of implementations.

It can be said that calisthenics exercise on both stable and unstable ground has a positive effect on body fat percentage and performance at the end of the 8-week exercise period. The principle of increased loading can be said to have a positive effect on body fat percentage and performance. However, calisthenics exercises on stable ground can be said to have less impact on performance than unstable ground. It may be helpful for coaches to use calisthenics exercises on a stable and unstable ground for performance improvement.

Analyzing the effects of exercise programs on performance; exercise program, duration and intensity of exercise program, gender, age, etc. according to many variables, different results appear in the literature. In addition, the measurement methods and devices used for performance evaluation can produce different results. In order to minimize the margin of error, a wider range of studies should be performed in terms of population.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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TÜRKÇE GENİŞ ÖZET

Bu çalışmanın amacı, yüzücü çocuklarda stabil ve stabil olmayan zeminde yapılan kalistenik egzersizlerin vücut yağ yüzdesine ve sportif performansa etkisini incelemektir. Çalışmaya aktif olarak yüzme branşında müsabakalara katılan ve antrenman planına uygun haftalık 7 saat üzeri (4-5 birim) antrenman yapan yüzücüler katılmıştır. Deneklerin çalışma esnasında veya öncesinde çalışmayı etkileyebilecek herhangi bir sakatlıklarının olmadığı kendilerinin, velilerinin ve antrenörlerinin onayları alınarak belirlenmiştir. Çalışmaya yaşları 12-14 arasında olan 30 yüzücü gönüllü olarak katılmıştır. Çalışmaya katılan yüzücüler 3 gruba ayrılmıştır. Birinci grupta 10 yüzücü stabil zeminde kalistenik egzersiz ve (4-5 birim) yüzme antrenmanı, ikinci grupta 10 yüzücü çocuk stabil olmayan zeminde kalistenik egzersiz ve (4-5 birim) yüzme antrenmanı ve üçüncü grupta 10 yüzücü çocuk (4-5 birim) yüzme antrenmanı yapmıştır. Çalışma haftalık en az 7 saat olmak üzere toplamda 8 hafta sürmüştür. Araştırmada boy, vücut ağırlığı, beden kitle indeksi (Sever, 2013), vücut yağ yüzdesi (Zorba, 2013), esneklik (Muyor ve diğerleri, 2014), 30 metre sürat (Tanner ve Gore, 2012; Young ve diğerleri, 2008), çeviklik (Harman vd., 2000), sırt ve bacak kuvveti (Zorba ve Saygın, 2017), mekik (Esco vd., 2008), şınav (Norton ve Olds, 1996), ve plank (Barwick ve diğerleri, 2012) ölçümleri alınmıştır. Tablo 1'de antrenman periyodu boyunca kullanılan normlar belirtilmiştir.

Elde edilen bulguların istatistiksel analizi IBM SPSS 19 paket programında yapılmıştır. Tüm gruplara ait tanımlayıcı bilgiler tablolaştırılmıştır. Değişkenlerin gruplara göre ilk son test dağılımları incelenmiş, dağılımların normalliği ve varyansların homojenliği Mauchly' Sphericity Testi ve Levene testi ile belirlenmiştir. Gruplar arası, grup içi ve antrenmanın etkisine ilişkin analizleri tekrarlı ölçümlerde çok yönlü varyans analizi (MANOVA) ile yapılmıştır. Anlamlı olan değerlerde Post Hoc karşılaştırmaları Bonferroni Testi ile belirlenmiştir. Anlamlılık derecesi 0,05 kabul edilmiştir.

Stabil olmayan zeminde kalistenik egzersiz yapan çocukların yaş ortalaması 12,70±0,67, boy ortalaması 1,45±0,06, vücut ağırlığı ortalaması 37,40±3,23 ve beden kütle indeksi ortalaması 18,64±1,24 olarak tespit edilmiştir. Stabil zeminde kalistenik egzersiz yapan çocukların yaş ortalaması 13,20±0,91, boy ortalaması 1,44±0,05, vücut ağırlığı 37,20±6,59 ve BKİ ortalaması 17,86±2,28 olarak bulunmuştur. Kontrol grubunun ise yaş ortalaması 13,00±0,81,

boy ortalaması 1,41±0,04, vücut ağırlığı 37,20±6,59 ve BKİ ortalaması 18,11±1,77 olarak tespit edilmiştir.

Çizelgede katılımcıların vücut yağ yüzdesini gösteren ölçüm sonuçları gruplar arası, grup içi ve grup*test ilişkisi bakımından karşılaştırılmaktadır. Vücut yağ yüzdesi stabil ve stabil olmayan zeminde kalistenik egzersiz yapan gruplarda anlamlı bir farklılığa rastlanmamıştır. Stabil ve stabil olmayan zeminde egzersiz yapan çocuklarda Bacak kuvveti, Sırt kuvveti, esneklik, mekik, şınav, plank, 30 metre sürat ve çeviklik testleri sonucunda grup içinde olumlu artışlar gözlemlenmiştir. Mekik ve plank testlerinde kontrol grubu için istatistiki bir artış görülmemektedir. Stabil zeminde kalistenik egzersiz yapan grubun bacak kuvveti ve plank değerlerinde daha fazla artış gözlemlenmiştir. Fakat sırt kuvveti, mekik, şınav, 30 metre sürat, çeviklik ve esneklik değerlerinde stabil olmayan zeminde egzersiz yapan grubun daha olumlu artış gösterdiği görülmektedir. Bacak kuvveti, sırt kuvveti, esneklik, mekik ve plank testlerinin tümünde test*grup etkileşimi gözlenirken, bu etkileşim stabil ve stabil olmayan grupların grup içi gelişimlerinden kaynaklanmaktadır. Fakat şınav, 30 metre sürat ve çeviklik testlerinde stabil olmayan gruptan doğan gruplar arası farklılık da test*grup etkileşimi bulunmaktadır.

Büyüme ve gelişme çağında, büyümeden bağımsız olarak antrenmana verilen yanıt merak konusu olmuştur. Bu alanda yapılan çalışmalarda oldukça çelişkili sonuçlar elde edilmiştir (Rowland, 1985; Vaccaro ve Mahon, 1987; Lemura vd., 1999; Acikada, 2004). Yukarıda belirtilen fiziksel, fonksiyonel ve cinsel gelişimlerin etkisiyle çocuklar hemen her yaşta farklı tepkiler vermektedir. Çocuklar, yetişkinlerin bir minyatürü görünümünde değillerdir. Yetişkinlerden farklı olarak, aerobik özellikli bir çalışmaya iyi yanıt veriyorlarsa, anaerobik çalışmaya da iyi yanıt vermektedirler (Lemura vd., 1999). Gelişim özelliğine bağlı olarak, belli bir yaşta elde edilen bir ölçüm değerinin, ilerlemiş yaşta ne olacağını tahmin etmek mümkün olmamaktadır (Rowland, 2000). Araştırmalar, çocukların antrenman yüklenmelerine verdikleri yanıtların yetişkinlikte de benzerlik taşıdığını göstermektedir. Buradan hareketle çocuk ve gençlerdeki antrenman yüklenimlerinde de antrenmanın temel ve yardımcı ilkelerinin geçerli olduğu (Harre, 1982) ve aşırı yüklenmenin şiddet, sıklık, hacim veya süre öğelerinin, antrenmana verilen yanıtta belirleyici oldukları gözlemlenmiştir (Ozmun vd., 1994). Bununla birlikte, çocuk ve gençlerde uygulanan antrenman yüklenimlerindeki şiddet ve sıklık dalgalanmaları ve buna bağlı elde edilen form değişiklikleri, yetişkinlere oranla daha az değişkendir (Bompa, 2000).

Bu verilere dayalı olarak düzenli kalistenik antrenmanın devamlılık prensibine göre haftada üç sıklıkla, her antrenman biriminde 60 dakika olmak üzere sekiz hafta ve üzeri

uygulanmasında sağlık ve performans getirisi açısından faydalar sağlayacağı söylenebilir. Ayrıca, zaman içerisinde uygulamalarda antrenman modlarının çeşitliliğinin sağlanması (ip atlama, elastik bantlar, step, sağlık topları) uygulamalar açısından faydalar sağlayacağı düşünülmektedir. Hem stabil hem de stabil olmayan zeminde yapılan kalistenik egzersizlerin 8 haftalık egzersiz periyodu sonunda vücut yağ yüzdesi ve performans üzerine olumlu etkisi olduğu söylenebilir. Artan yüklenme ilkesinin vücut yağ yüzdesi ve performans üzerinde olumlu etkisi olduğu söylenebilir. Fakat stabil zeminde yapılan kalistenik egzersizlerin stabil olmayan zeminde yapılan kalistenik egzersizlere göre performansa daha az etkisi olduğu söylenebilir. Antrenörlerin performans gelişimi için stabil ve stabil olmayan zeminde uygulanan kalistenik egzersizleri kullanmaları faydalı olabilir. Egzersiz programlarının performansa etkileri incelendiğinde; yapılan egzersiz programı, egzersiz programının süresi ve şiddeti, cinsiyet, yaş vb. birçok değişkene göre farklı sonuçlar ortaya çıktığı literatürde göze çarpmaktadır. Ayrıca performansı değerlendirme için kullanılan ölçüm metodları ve cihazlarıda birbirinden farklı sonuçlar verebilmektedir. Hata payını en aza indirgemek için popülasyon bakımından daha geniş çalışmalara yer verilmelidir.