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Short Communication

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The Effect of Four Months of Detraining Following Eight Months of Corrective Exercises on Lumbar Lordosis of Schoolgirls

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ABSTRACT
The purpose of the present research is to study the effect of 4 months of detraining following 8 months of corrective exercises on lumbar lordosis of schoolgirls after maturity.The subjects were the girls having the increased lordosis in while they were in the 5th stage of tanner and fell into the experimental group (n=16) and the control group (n=16). The experimental group participated in corrective exercises program for 8 weeks. The lumbar lordosis was checked before and 8 weeks after the corrective exercises and it was clarified that those having the lumbar lordosis were healed. Then, 4 months of detraining were applied and rechecking was finally done.The findings show that 4 months of detraining following 8 months of corrective exercises lead to increase lumbar lordotic mean angle in the experimental group in comparison with the control group ($p<0.05$). The observations indicate that although corrective exercises were effective on healing the lumbar lordosis of mature schoolgirls, 4 months of detraining let it be back. So, the subjects are required to participate in a continual program including corrective exercises in order to maintain the effect of the exercises, and this program is not to be abandoned after observing the desired results. Hence, correcting the lifestyle which is effective on the emergence of lumbar lordosis should be taken into account.

Key Words: maturity, corrective exercises, maintenance of training, spinal abnormality.

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INTRODUCTION

The spine as the linchpin of the body is a complex structure consisting of vertebrae, discs, muscles and many ligaments. Due to being prone to many injuries, it is paid attention to by many researchers. But of all the most important arches of the spine, lumbar lordosis is of high significance because of bearing the weight of the trunk and pelvis (1). One of the important abnormalities of this area is the increased lumbar lordosis which is more prevalent amongst girls, according to the results of epidemiology, in a way that 32.2% of adolescents have this problem (2). Perhaps, one of the reasons that teenagers have postural abnormalities is the change due to growth spurt which makes the body posture change between the ages 11 and 15 (3). These changes and abnormalities appear as an unsatisfactory performance at first and affect ligaments, cartilages, and muscles. Then, affecting the structure of joints and bones, they lead to the structural changes (4). Mackenzie believes that failure to correct these abnormalities until high school will lead to the postural changes like pains in the musculoskeletal system, joint deformation, muscular fatigue, and biomechanical imbalances (5). Accordingly, many researches have been conducted on different age groups, and each has led to different results, however, most of them cited the positive effect of corrective exercises on lordosis. Mendoza *et al.* (2002) observed a meaningful decrease in the curvature of the spine in students of 6 to 17 years old after a course of corrective exercises (6). Also, Taheri *et al.* (2009) observed that corrective exercises were the effective factor on lordosis with a meaningful decrease in the adolescents of 11 to 15 years old (7). However, the durability of the exercise after one course of practical program has always been taken into account by the researchers, because the short-term results of these exercises have only been referred to in most researches and only few of them have studied the maintenance and durability. Experience shows that most of the people who take care of their abnormalities with the help of corrective exercises stop their training after finishing the training course, indicating that the level of flexibility and range of motion achieved after 4 weeks of detraining would wear off. Also, Faigenbaum *et al.* (1996) indicates that 2 months of detraining leads to decrease the acquired strength of the experimental group rather than the control group (8). Given what has been mentioned, this question arises if it is possible to makes sure that teenagers find no abnormalities by participating in one course of exercises? Hence, it is more vital than before to conduct a research with the purpose of studying the maintenance of training. So, this study has been conducted to study the effect of 4 months of detraining following 8 months of corrective exercises on lumbar lordosis of schoolgirls.

MATERIALS AND METHODS

The present research is of the semi-experimental type. In this research, all the 17-year-old students of the 12^{th} region of education in the city of Tehran have been assessed based on initial screening. A number of 32 students having the increased lordosis (in the 5^{th} stage) participated in the research, those whose lordosis was more than 58 degrees (9). They were divided into the control and experimental groups at random. The lumbar arch was measured by a flexible ruler and through the method of Youdas (S2-T12) before beginning the training program. The training program included stretching the flexor muscles of the hips and the extensor muscles of the spine and improving the extensor muscles of the hips and abs muscles. The experimental group did the exercises three sessions a week for 8 weeks. The stretching exercises of at 3

sets of 5 seconds in the first week reached 15 seconds in the last week. The strength trainings of 3 sets with the intensity of 65% for the repetition of 8 times a week turned to the intensity of 100% for the repetition of 12 times in the 8th week. The experimental group participated in the program of corrective exercises for 8 weeks. The lumbar lordosis was measured before the corrective exercises and 8 weeks after them, and it was clarified that people having the lumbar lordosis healed (10). Then, 4 months of detraining were applied, and rechecking was done at last. The control group lived their normal life in every stage. Also, the experimental group didn't do a special activity in the time interval between the first and second test.

The analysis of covariance (ANACOVA) was applied after collecting data. The statistical tests were done through using the SPSS software at the confidence level of 95% and α at the meaningful level of 0.05.

RESULTS

Thirty-two participants took part in this research while their height, weight, and BMI were reported in table 1.

Table 1. Demographic parameters of subjects

Group	Age (year)	Height (cm)	Weight (Kg)	BMI (Kg/m^2)
Exprimental	17.06 ± 0.44	160 ± 5.57	52.46 ± 6.13	20.36 ± 2.43
Control	17.12 ± 0.34	159 ± 5.61	58.68 ± 8.98	22.9 ± 2.67

The statistical analyses indicated that 4 months of detraining following 8 months of corrective exercises led to meaningfully increase ($p<0.05$) the mean angle of lumbar lordosis in the experimental group (from 65.33±2.9 to 60.73±6.23), although no meaningful changes were observed in the control group (Figure 1).

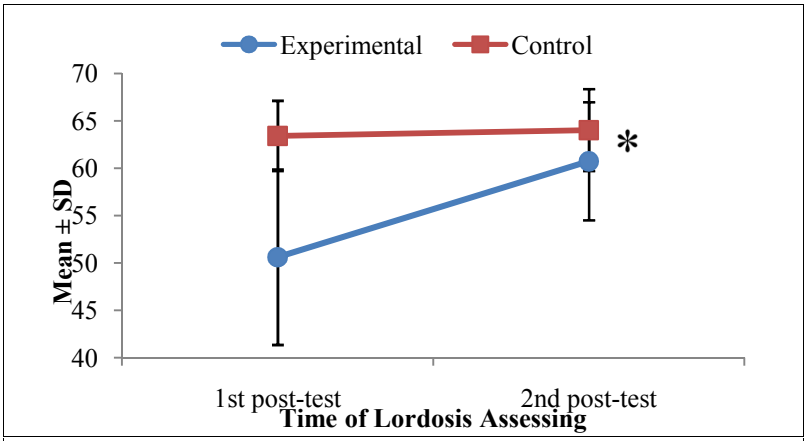

Figure 1. *Lumbar lordosis after 4 months of detraining following 8 months of corrective training*. ***:** Significant difference between groups at $p < 0.05$.

DISCUSSION and CONCLUSION

The present research aims to study the effect of 4 months of detraining following 8 weeks of corrective exercises on the lumbar lordosis in schoolgirls. The previous studies done of this group indicates that the increased lumbar lordosis in the experimental subjects reduced after 8 weeks

of training (10). However, the mean angle of lordosis increased meaningfully due to 4 months of detraining, which are consistent with the observations by Shavandi and Sinaki. Shavandi *et al.* (1390) indicated that 7 weeks of corrective exercises led to reduce the abnormalities, but the abnormalities increased again after 4 months of detraining (11). The results of Sinaki *et al.* (2002) indicated that strength training led to reduce the abnormalities in women, but a follow-up of 8 years revealed that the strength of muscles reduced again and the angle of abnormalities increased (12).

Findings of the research show that the acquired strength was temporary and it reduced after a period of detraining. Detraining decreases the muscular power and strength of teenagers to the level of the control group (13). Faigenbaum *et al.* (1996) reported that a rapid and meaningful reduction occurs in the strength of teenagers after 8 weeks of detraining (8). Perhaps, the level of testosterone and free androgen index remains the same during 4 months of detraining (8), and reduction in muscular strength through decreasing the muscular mass and protein content with existing water in it, reduction of the nerve frequency and its natural call of some fibers, reduction of inhibitory performance of the central nervous system on muscles, reduction of the organ sensitivity of Golgi tendon, and changes the neuromuscular junction of motor units are justifiable (14). However, the results indicate that the flexibility returns to the initial level after 3 months of detraining (8). Considering the point that the program of corrective exercises is a set of strength and stretch training, the changes return to the former state in short time and the lordosis angle increases again if a person stops training (The subjects of this research didn't continue their training.) (11). Therefore, it is necessary that the people intending to improve their postural statues with the help of these corrective exercises do the training with time in order to prevent the complications of detraining like the increment of lordosis angle. On the other hand, daily activities of human require the simultaneous contraction of auxiliary and stabilizing muscles. Proprioceptive impulses from receptors in the muscles, connective tissues and joint capsule which are issued have important roles for the proper implementation of training. Therefore, every rehabilitation program of the spine should involve Closed chain motion and exercises at weight-bearing postures because these exercises are closer to the real statuses of life (11). Since these exercises are not prescribed to the subjects in this research, it might be one of the reasons that the lordosis angle returned to the former state quickly. The observations indicate that although corrective exercises was effective in improving the lumbar lordosis in mature schoolgirls, 4 month of detraining caused it to be back. Hence, the subjects need to participate in a continual program of corrective exercises in order to maintain the effects of training, and the training program must not be abandoned by observing the desired results so that modifying the effective lifestyle modification should be considered in the development of lumbar lordosis.

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تازه‌های علوم کاربردی ورزش
دوره اول، شماره دوم
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اثر چهار ماه بی تمرینی متعاقب هشت هفته تمرینات اصلاحی بر لوردوز کمری دختران دانش‌آموز

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چکیده

هدف تحقیق حاضر بررسی اثر ۴ ماه بی‌تمرینی متعاقب ۸ هفته تمرینات اصلاحی بر لوردوز کمری دختران دانش‌آموز پس از بلوغ بود. آزمودنی‌ها دختران دارای لوردوز افزایش یافته بودند که در مرحله ۵ تانر قرار داشتند و به دو گروه تجربی (n = ۱۶) و کنترل (n = ۱۶) تقسیم شدند. گروه تجربی به مدت ۸ هفته در برنامه تمرینات اصلاحی شرکت کردند. قبل و ۸ هفته پس از تمرینات اصلاحی لوردوز کمری اندازه‌گیری شد و مشخص شد که افرادی که دارای لوردوز کمری بودند، بهبود یافتند. سپس ۴ ماه بی‌تمرینی اعمال شد، و در نهایت اندازه‌گیری مجددی صورت گرفت. یافته‌ها نشان می‌دهد ۴ ماه بی‌تمرینی متعاقب ۸ هفته تمرینات اصلاحی موجب افزایش میانگین زاویه لوردوز کمری در گروه تجربی در مقایسه با گروه کنترل شد ($p < ۰/۰۵$). شواهد حاکی از آن است که اگرچه تمرینات اصلاحی در بهبود لوردوز کمری دختران دانش آموز بالغ مؤثر بود، اما ۴ ماه بی‌تمرینی سبب بازگشت آن شد، لذا جهت ماندگاری اثر تمرین، آزمودنی‌ها نیازمند شرکت در برنامه تمرینات اصلاحی مستمر هستند و با مشاهده نتایج دلخواه، زود هنگام نباید برنامه تمرینی را رها کرد. از این رو، مسأله اصلاح سبک زندگی مؤثر در بروز لوردوز کمری باید مد نظر قرار گیرد.

واژگان کلیدی: بلوغ، تمرینات اصلاحی، ماندگاری تمرین، ناهنجاری ستون فقرات.

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