

## Effects of core stability exercises on selected motor proficiency indices and self-confidence in teenage girl roller-skaters

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### ABSTRACT

Successful performance in many sports such as roller skates, often require recognition and appropriate agility, balance and self-confidence to various situation. To achieve a high level of proficiency and self- confidence, good core stability can help maximize roller skates performance. The purpose of this study was to determine the effects of core stabilization exercises on selected motor proficiency indexes (agility and dynamic balance) and self-confidence in girl roller skaters. This is an experimental study. The population consists of the girls roller skaters between 14-16 years of age. Based on Solomon four group design, a total of 40 girl athletes were randomly assigned into four experiment and control groups. During 8 weeks each group received its own treatment and then all groups participated in a posttest. The experimental groups received experimental treatment during the experiment. The comparison of posttests indicated that experimental treatment (core stability training) has not significant effect on the balance, agility and self-confidence of girl roller skaters. It is, therefore, could be concluded that more intensity and duration of exercises are needed if the experimental treatment effect to increase the self-confidence, balance and agility of participants in the study.

**KEY WORDS:** AGILITY, BALANCE, CORE STABILITY, SELF-CONFIDENCE

### INTRODUCTION

For high-level competition, it is necessary to have a good motor proficiency. Balance and agility are two important parameters of motor proficiency for athletes and for the selection of athletes for any competition. On the

other hand, self-confidence and these parameters due to core stability training can provide significant benefits for players and teams, and this training is easy to incorporate into any training session. In recent years, fitness practitioners have recommended core stability exercises in sports programs. Despite the popularity of core sta-

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bility exercises, relatively little scientific research has been conducted to show the benefits for healthy roller skater athletes. Panjabi (2003) defined core stability as “the capacity of the stabilizing system to maintain the intervertebral neutral zones within physiological limits”. Core stability is a dynamic term that continually changes to meet postural adjustments or external loads accepted by the body. This concluded that to increase core stability, exercises must be performed that simulate the movement patterns of a given sport. From a sports performance view, greater core stability provides a foundation for greater force production in the upper and lower extremities (Schibek, 2001). Among the most important factors contributing to physical activity participation is motor proficiency. Motor proficiency is characterized by qualitatively different aspects of both gross and fine motor development and serves as an index of children’s motor development. Children that are competent movers seem to find their participation in physical activity and/or sports enjoyable and, in so doing, form a lifelong association with Physical activity;. However, those with poor movement skills appear to avoid Physical activity. Therefore, hindering the development of their skills, a fact that further restricts their participation in physical activity, dynamic balance and agility are two important parameters of motor proficiency for selection of athletes for various competitions during preseason evaluation. (Venetsanou and Kambas, 2016).

Agility is defined as an effective and quick coupling of braking, changing directions and accelerating while maintaining motor control in either a vertical or horizontal direction. An athlete who displays good agility will most likely possess other qualities such as, dynamic balance, spatial awareness, rhythm, as well as visual processing. Developing agility in children is a process that continues over a long period of time. Basic methodology of agility training implies the learning of a basic walking technique, running technique, change of direction, jumps and landings (Wroble & Moxley, 2001). Liu-Ambrose *et al.* (2004) concluded that agility training significantly improved balance confidence after 13 weeks and change in balance confidence not significantly correlated with changes in physical activity level, (Young and Farrow, 2006 and Gribble *et al.*, 2012).

Since balance is such an important aspect in competition, it is necessary to find suitable programs for maintaining proper balance. One such suggestion that has been made in an effort to balance is training. Training the core stability muscles especially has been hypothesized as an improvement program. Many researchers use this training for increasing dynamic balance (Chung *et al.* 2013, Khale, 2009).

Matsuda *et al.*, (2008) reported that laterality was not found in balance for the one-leg stand in soccer players,

basketball players, swimmers, and non-athletes. No significant difference was found in each balance parameter between the groups. However, this study shows that the ability to balance between the athletes have is different. Recent research suggests that agility, is a learnable skill that is gained through regular training, (Holmberg, 2009, Anderson and Behm, 2005). Successful performance in most of sports often need to react appropriately to different sport situations. Among the psychological factors involved in competition, many studies have dedicated to self-confidence. International elite athletes consider the self-confidence as the most important mental skills (Bull *et al.*, 2005).

Self-confidence in sports, is called sport self-confidence, which is regarded as a belief or the confidence degree of individuals about their ability to achieve success in the sport (Wealey *et al.*, 1998). The sources of self-confident of exercise are among the influential factors that plays an important role in the formation of sport self-confidence. This researcher has identified nine sources for the sport self-confidence: mastering the skills, presentation of skills, physical/mental fitness, physical self-expression, social support, coaching leadership behavior, alternative experiences, environmental comfort and arbitrary position. Sources of self-confidence are the most critical factor in the development of sports and athletes’ self-confidence (Smith (1976, Bandura, 1997, and Nicholas, 1994). Wealey *et al.* (1998) have indicated that identification of the self-confidence sources is to be considered before any interventions to develop self-confidence.

Previous studies suggest that experience in mastering the skills or past performance are considered among the most important source of confidence for all athletes, (Wiley *et al.*, 2008). Skill Mastering, physical and mental fitness and in other words the sources which can considered as past experiences, are the most important source of self-confidence of the individual or team athletes (Wilson *et al.*, 2004) of adolescents and adults (Bulger *et al.*, 2004) who are passing a rehabilitation program. Dominance on the skills and physical/ mental fitness are recognized as the most important source of self-confidence in the different aged athletes, before, between and after the competitions (Wealey *et al.*, 2009). Previous study has shown that previous experience in the early stages of learning is an important source of confidence for athletes (Jong *et al.*, 2006).

Thus, the self-assessment of individuals of his/her success and value, determines the degree of self-confidence. Self-confident, is in fact, the idea that the person believes about his//her own set of abilities ,competencies and characteristics. Feltz, (1988) believes that self-confidence is the most important factor that affects athletic performance and the lack of it leads to defeat. Bayazit

(2014) investigated the effect of recreational sports on the self-confidence of the teenager girls and concluded that physical activity has a significant effect on confidence.

Roller Skating is a lifetime fitness sport, well-suited for both children and adults. In addition to building cardiovascular fitness, it contributes to the development of balance and coordination. Another major benefit is the sport's potential for social integration as a recreational activity. People who master basic skills can participate in family, school, church, and community roller skating outings. The wide range of competitive events offered meet the needs of athletes with limited balance and challenge those with advanced skill. Roller skating sport, which is seemingly dangerous, has some benefits that outweigh the risks. Young people tend to this sport, which has its own benefits for the mind and body. Roller skating sport was invented in California when the weather was not conducive for water skiing and surfing on the water, they were firstly used for entertainment. With one hundred million active roller skaters in the world, it is one of the most popular hobbies around the world (De Boer *et al.*, 1987).

Unlike other sports, roller skating can be performed alone which brings absolute freedom for the athletes. Skate roller is an individual sport and the skater is responsible for his success. Skater must rely on his own individual and physical skills and such a mindset brings high level of self-confidence in time of success. High level of self-confidence increases courage. Balance loss in jumping is the biggest fear for roller skaters thus, the core stability exercises for jumping which depends on balance, agility and self-confidence brings the required ability for skater to properly perform complicated movements and sophisticated jumps. This study intends to evaluate the effect of 8-week training program of core stabilization training on the self-confidence and some indices of motor proficiency in girl roller skaters.

## MATERIALS AND METHODS

This research is an experimental study with the Solomon four group design. It is a way of avoiding some of the difficulties associated with the pretest-posttest design. As the researchers manipulate the independent variable to investigate its effects on the dependent variable, it is a prospective study and based on the subject and target is an applied type and based on the implementation is considered as a field study. Statistical population of the current research are the girl roller skaters between the age group of 14-16 years, with two years of experience in sport competitions. A total of 40 subjects registered and were randomly assigned to in four groups of experimental and control each with 10 individuals.

For measuring an athlete's dynamic balance, Star Excursion Balance Test (SEBT) is used. The measure of dynamic postural control is inferred from how far a participant can reach while maintaining a base of support. The SEBT consist a series of 8 unilateral balance tests. In this test, the participant stands at the center of a grid laid on the floor with 8 lines extending at 45 degree increments from the center of the grid. The stance leg perform in the closed kinetic chain with motion occurring at the ankle, knee, and hip joints as the opposite leg reaches along a line in the specified direction. The participant touches the line with the most distal part of the foot and as lightly as possible to ensure they are not also using that leg for support. The reach distance is measured and the subject returns to a bilateral stance while maintaining balance. This test is the postural control system as the body's center of mass is moved in relation to its base of support, making it a useful measure for performance following training.

To assess agility, Agility T-test is used. This test is appropriate for all players. It measures the time taken to complete a course that includes forward, lateral, and backward running. In the test, subject requires to touch a series of cones set out in "T" shape whilst side stepping and running as fast as possible. 3 cones places 5 meters apart on a straight line and a 4th cone placed 10 meters from the middle cone so that the 4 cones form a T. The subject stands at the base of the T facing the T and stand with one hand and the opposite foot on the start line. Then examiner gives the signal to "Go", starts the stopwatch and the subject commences the test. The subject runs to and touches the middle cone, side steps 5 meters to the left cone and touches it, side step 10 meters to the far cone and touches it, side step 5 meters back to the middle cone and touches it and then runs 10 meters backwards to the base of the "T" and touches that cone. The examiner stops the stopwatch and records the time when the subject touches the cone at the base of the "T". The Monk Tilo (1996) self-confidence questionnaire was used to measure the self-confidence. The questionnaire included 13 items that can be answered via yes and no response. In the recent study, the reliability coefficients of the self-confidence questionnaire were calculated using Cronbach's alpha and split-half method which are 0.72 and 0.30 respectively, that demonstrate acceptable reliability coefficient of the questionnaire.

The design of the experiment was the Solomon four-group design, considered especially suitable for control of secondary variance, including pretest sensitization to the balance and agility tests. Specifically, pretesting allowed for assessing the equality between two groups, which was necessary for distinguishing the potential results of withdrawal from the generally positive effects of exercise. Initially, 40 subjects registered for the exper-

iment and were randomly assigned to four groups each group 10 subjects. The groups assigned to each were the following: (a) pre-test (balance, agility Tests and self-confidence questionnaire), treatment and post- test; (b) pretest-no treatment, post- test; (c) no pre-test, treatment, and post- test and (d) no pretest-no treatment and post- test (table 1). So, subjects of group 1 and 3 performed core stability training in 3 session during 30 minutes. At the end of 8 week training, all groups performed post- test containing balance test, agility and complete self- confidence questionnaire.

The core stabilization exercise included of three sub-parts, bed exercises, wedge exercises, and ball exercises using a Swiss ball. First, the bed exercises without devices contains of bridge exercise, bridge exercise with legs crossed, bridge exercise with one leg, curl-ups with straight reaching, curl-ups with diagonal reaching, bird dog exercise, and side bridge exercise. Second, the wedge exercises contains of curl-ups with straight reaching, curl-ups with diagonal reaching, and curl-ups with arms crossed. Finally, the ball exercises contains of bridge exercise, bridge exercise to the side, bridge, abdominal curl-ups, bird dog exercise, and push-ups. The experimental group began with a standard 15 minute warm-up and was asked to perform three sessions of core stabilization exercises per week lasted 30 minutes.

Table 1: Solomon four group design

Test		pre-test	Treatment	post-test
Group 1	R	0	X	0
Group 2	R	0		0
Group 3	R		X	0
Group 4	R			0

Table 2: Descriptive statistics of research variables in experimental and control groups

Variable	Group	Indices							
		Mean		SD		Min		Max	
		pre	post	pre	post	Pre	post	pre	post
E	Experiment1	-	71.9	-	0.99	-	70.4	-	73.7
	Control1	-	73.3	-	0.59	-	72.4	-	74.4
	Experiment2	73.7	73.9	0.79	1.2	72.5	70.9	75.1	74.9
	Control 2	73.9	73.9	0.71	0.87	73	72.4	75.2	75.2
Agility	Experiment 1	-	27	-	1.7	-	24	-	29
	Control 1	-	27.7	-	1.25	-	25	-	29
	experiment 2	27	27.3	1.7	1.8	24	24	29	29
	Control 2	27.7	27.2	1.25	1.4	25	25	29	29
Self Confidence	Experiment 1	-	27.5	-	2.3	-	24.6	-	31.5
	Control 1	-	28.8	-	2	-	25.9	-	31.5
	Experiment 2	27.5	28.3	2.3	0.7	24.6	27.3	31.5	29.5
	Control 2	28.8	28.5	2	1.9	24.9	24.9	31.5	31.5

## RESULTS AND DISCUSSION

Data of above Table show the descriptive results related to balance, agility and self-confidence variables in the experimental and control groups. According to the design, for testing the first hypothesis of this research that core stability training increases the balance of subjects, two-factor variance analysis was used. First, to investigate the two-factor variance analysis, the homogeneity of variable variance was investigated using Levine's F Test. Table 3 shows the results of this investigation. According to the results, the significant level is more than 0.05, thus the homogeneity of variances is correct.

Table 4 shows the results of two factor variance analysis of scores balance post- test with two factors pre-test and core stability training.

Accordance the results of table 4, besides of main effects of each factors, we can study the interaction effect. As the table shows the main effect of pre-test is significant ( $F(1, 36)=7.2, P<0.05$ ).

So, balance of subjects that have pre- test is different with pre-test of subject that have not pre-test. Main effect of core stability training factor is different ( $F(1, 36)= 13.9, P<0.05$ ). So, there is significant differences between subjects in core stability training. Interaction effect between two factors of pre-test and core stability is not significant ( $F(1, 36)= 0.5, P<0.05$ ). So, we can concluded that core stability training effects in pre-test is the same in subjects for two level of variables.

According to the design, for testing the second hypothesis of this research that core stability training increases the agility of subjects, two-factor variance analysis was used. First, to investigate the two-factor variance analysis, the homogeneity of variable variance

Table 3: Comparison of homogeneity of variance using Levine's test in balance

Sig	df2	df1	F
0.6	36	3	2.6

Table 4: Results of two factor variance analysis of post- test balance scores

Source	SS	df	SM	F	P
Pre-test	6.7	1	6.7	7.2	0.01
Core Stability Training	13.08	1	13.08	13.9	0001
Post- test*core stability scores	0.48	1	0.48	0.5	0.5
Error		33.6	36	0.93	
Total		213305.1	40		

Table 5: Comparison of homogeneity of variance using Levine's test in agility

Sig	df2	df1	F
0.5	36	3	0.8

was investigated using Levine's F Test. Table 5 shows the results of this investigation. According to the results, the significant level is more than 0.05, thus the homogeneity of variances is correct.

Table 6 shows the results of two factor variance analysis of scores agility post- test with two factors pre-test and core stability training.

According the results of table 6, besides of main effects of each factors, we can study the interaction effect. As the table shows the main effect of pre-test is not significant ( $F(1, 36)=0.04, P<0.05$ ). So, agility of subjects that have pre- test is not different with pre-test of subject that have not pre-test. Main effect of core stability training factor is not different ( $F(1, 36)= 0.38, P<0.05$ ). So, there are not significant differences between subjects in core stability training. Interaction effect between two factors of pre-test and core stability is not significant ( $F(1, 36)= 0.67, P<0.05$ ). So, we can conclude that core stability training effects in pre-test is the same in subjects for two levels of variables.

According to the design, for testing the third hypothesis of this research that core stability training increases

the self-confidence of subjects, two-factor variance analysis was used. First, to investigate the two-factor variance analysis, the homogeneity of variable variance was investigated using Levine's F Test. Table 7 shows the results of this investigation. According to the results, the

significant level is more than 0.05, thus the homogeneity of variances is correct.

Table 8 shows the results of two factor variance analysis of scores self-confidence post- test with two factors pre-test and core stability training.

According the results of table 8, besides of main effects of each factors, we can study the interaction effect. As the table shows the main effect of pre-test is not significant ( $F(1, 36)=0.2, P<0.05$ ).

So, agility of subjects that have pre- test is not different with pre-test of subject that have not pre-test. Main effect of core stability training factor is not different ( $F(1, 36)= 1.6, P<0.05$ ). So, there is not significant differences between subjects in core stability training. Interaction effect between two factors of pre-test and core stability is not significant ( $F(1, 36)= 0.8, P<0.05$ ). So, we can concluded that core stability training effects in pre-test is the same in subjects for two level of variable

The purpose of this study was to determine the effects of 8 week score stabilization exercises on selected motor proficiency indexes (agility and dynamic balance) and self-confidence in girl roller skaters. The results of this study suggest that core stability exercises and pre-test have significant effect on subjects' balance. One possible causes of this result might be due to muscle strengthening around the spine, which leads to less flexibility; the more powerful the muscles the greater the tension they provide. Armstrong pointed out that with the increased

Table 6: Results of two factor variance analysis of post- test agility scores

Source	SS	df	SM	F	P
Pre-test	0.1	1	0.1	0.04	0.8
Core Stability Training	0.9	1	0.9	0.38	0.5
Post- test*core stability training	1.6	1	1.6	0.67	0.4
Error	85.8	36	2,4		
Total	29900	40			

Table 7: Comparison of homogeneity of variance using Levine's test in self-confidence

Sig	df2	df1	F
0.3	36	3	3.4

Table 8: Results of two factor variance analysis of post- test self-confidence scores

Source	SS	df	SM	F	P
Pre-test	0.72	1	0.72	0.2	0.6
Core Stability Training	5.7	1	5.7	1.6	0.2
Post- test*core stability training	2.9	1	2.9	0.8	0.3
Error	122.9	36	3.4		
Total	32165.74	40			

power, flexibility decreases. The adverse effect of power on flexibility is apparent in many sport, especially in track and field athletes, gymnastics and fitness professional and other athletes. The result of this research is in-line with researches of Schibek (2001), Milanovic *et al* (2013), Iacono *et al.* (2014).

The second hypothesis that investigates the effect of core stability training on the agility, represents the fact that core stability training has no significant effect in the agility of the participants. To explain this, type and intensity of the exercise may be mentioned so that for implementation a continuous reforms is needed to withstand the anti-balance effects of the gravity and fluctuations during running and jumping; the central and peripheral nervous system has to position the center of gravity of the body gravity and perform the required motions to correct a deviated center of gravity.

The neurological processes and systems used in the balance are visual, auditory and sensory input, as well as stimulation of the muscles and joints. Agility also is acquired through its acquisitive nature. Therefore, regardless of the type of training provided in this study, it can be expected to improve results in other age groups as a result of other training exercise. Because of maturing status and motor development, this age group does not seem to be able to perform delicate skills which were performed in the agility test. The ability to execute subtle skills that have been implemented as part of the agility test. Thus, the strength measurement can only be able to classify or separate skills and talents. As this research is innovative it is not analogous to other researches.

Finally, the third hypothesis of the research which investigated the effects of core stability exercises on the self-confidence of the athletes shows that these exercises have no significant effects on the self-confidence and this psychological factor is influenced by variety of different cases such as: communication, subjectivity childhood, family history, and many other factors.

It seems that short time of the training is one of the factors. Self-confidence is the ability to work alone and set up a personal judgment and provide the innovative and creative work. It is believed that the spirit of inde-

pendence and self-reliance has not yet increased in these children according to their physical ability.

This research study is not in-line with the finding of Sheranz *et al* (2012). One possible causes of this difference may be the differences in the age of participants, limited experience and the way of reporting the sample group. The results showed that in teenager girl roller skaters, exercise improves balance. Therefore, it is recommended to increase roller skates exercises to increase balance. However, this exercise did not cause any change in their self-confidence, so it is recommended to use psychological skills in order to improve their performance to increase their self-confidence and then focus on their physical dimensions.

The findings of this study showed that core stability exercises have no effect on the agility and it is recommended to investigate the methods to increase this perceptive-motor variable. As the physical and mental dimensions are closely related it is not just sufficient to focus on the physical training of the children, therefore it is recommended that coaches of physical training to pay attention to this aspect of the children life and their needs.

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