The Effects of Core Stabilization Training in Collegiate Ballet Dancers

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Introduction

Muscular strength and endurance is an essential component of physical fitness, with clearly established health benefits (1). Within competitive athletics, the incorporation of core stabilization training is critical to the development of strength, power, speed, agility, and flexibility (6). Despite the well-established and evidence-based benefits of core stabilization training, the impact of core stabilization training on dance performance is largely unknown.

During athletic activity, individuals must utilize their core which consists of the lumbopelvic hip joint complex and the musculature in this region (7). Research in various sports has shown the benefits of core stabilization training. Core stabilization increases strength and dynamic balance when incorporated into an athlete's training program (3, 7, 8). Koutedakis et al. showed that increases in strength and balance benefit dance ability (4).

Ballet is not only an art form, but also an athletic activity. In order to excel at this activity, dancers are required to have a large range of motion at the hip joints and a high level of muscular strength and flexibility (9). In order to improve upon these requirements, dance research is focusing on various forms of supplemental training, such as stretching and strength training (2). A large portion of research highlights the benefits of stretching to improve flexibility. However, there is a lack in research on core stabilization training for dancers. This may be due to a fear that core stabilization training causes loss of flexibility or a bulky appearance (5). The fear combined with a potential overemphasis on flexibility results in an increased risk for injury (5). However, this belief is not supported by research. For example, Wyon et al. showed that strength training in dancers does not cause a loss in flexibility, but

actually improves it (9). Therefore, the purpose of the study is to determine the impact of core stabilization training in collegiate ballet dancers. It is hypothesized that the training program will result in increases to core endurance and dance ability.

Methods

Participants

Subjects in this study were selected from students enrolled in the University of Minnesota Duluth's dance course DN 1131: Ballet Technique I. This was the only requirement to participate in the research; therefore, individuals who were not enrolled in DN 1131 were excluded. The subjects were protected through the Institutional Review Board (IRB). All subjects signed a consent form which verified that they fully understood the purpose, risks, requirements, and benefits of the research study.

Procedures

The research design studied the effects of a 6 week core stabilization program in a population of novice collegiate ballet dancers. Dancers were recruited from the three sections in UMD's School of Fine Arts dance course DN 1131: Ballet Technique I. Prior to beginning the 6 week program, all subjects were assessed with a timed plank, timed passé balance, and timed passé side bridge. For these assessments, subjects were required to maintain a neutral spine. Each subject will be assessed individually for their own neutral spine. Subjects held a dowel behind their back with contact at the sacrum, the middle of the back, and the back of the head. Then the natural lordotic curve of the spine was measured. Subjects participated in core stabilization training two days per week for approximately 10 minutes during their DN 1131 class. The exercise program followed a progression that increased in difficulty and is outlined on the next page (Table 1). The program was instructed and supervised by the Principal

Investigator throughout the intervention. At the end of the 6 week program, all subjects were reassessed on the three pre-test variables.

Week	Training (4 sets of 10 reps)
1	Dead bug wall press @ 45°, Quadraped hip extension
2	Dead bug wall press @ 180°, Bird dog
3	Dead bug w/o arms @ 45°, Bird dog w/ 8 second hold, & Side bridge long lever
4	Dead bug w/o @ 180°, Plank from forearms, & Side bridge long lever with arm
5	Dead bug @ 45°, Push up plank, & Side bridge passé
6	Dead bug @ 180°, Passé plank, and Side bridge passé with arm

Table 1: 6 week core stabilization training program

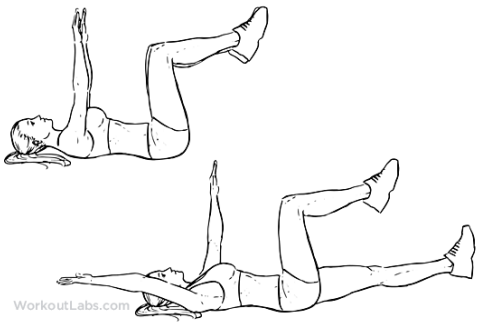

Figure 3: Dead Bug

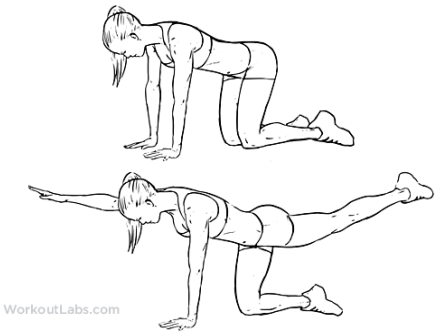

Figure 4: Bird Dog

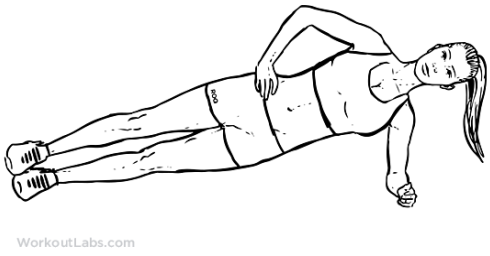

Figure 5: Side Bridge

Instrumentation

The pre- and post-assessment tests were measured while the subjects maintain a neutral spine. This ensured that the tests were valid and truly measured the muscular endurance. The tests were also piloted tested to ensure that they were reliable and could be repeated consistently

on all subjects. In addition, to ensure the subjects were assessed consistently, the tests were conducted by the Primary Investigator only.

Statistical Analysis

A paired t-test was performed to determine differences in the pre-post assessments data. The level of significance was set at $p < 0.05$.

Results

Pre-post assessment results for each of the three procedures are presented in Table 2 with the data shown as mean ± SD. Figure 6 depicts the means of the pre and post assessments. There were significant differences between the pre-post assessment in both the plank (p=0.036) and the passé (p=0.024). There was no significant difference between the pre-post assessment of the side bridge (p=0.0427).

Assessment	Pre (s)	Post (s)	Δ (s)	p-value
Plank	43.15±27.77	49.96±23.04	6.81±17.89	0.036*
Passé	2.94±2.16	5.16±6.40	2.22±5.39	0.024*
Side Bridge	22.85±13.44	24.84±9.12	1.99±14.20	0.427

Table 2: Values are given as mean ± SD. *Statistically significant from Post-Pre.

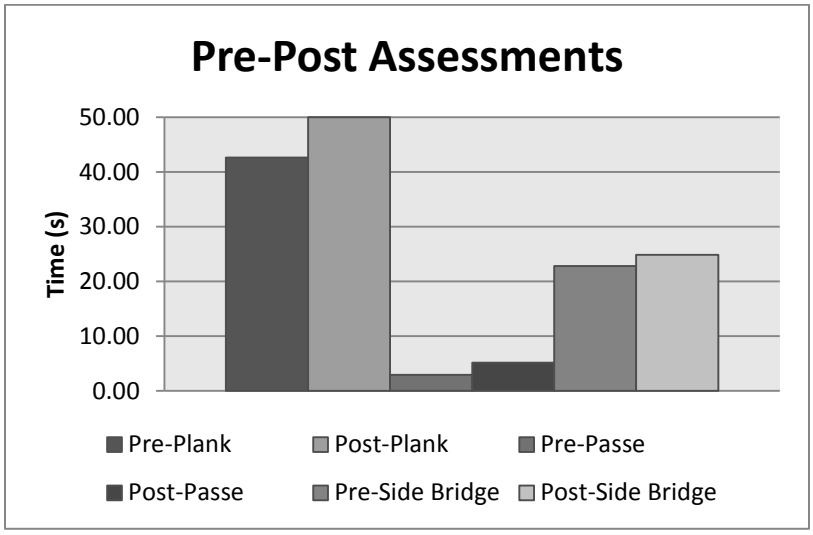

Figure 6: Graph of the pre-post assessment differences in mean.

Discussion

The purpose of this study was to determine the impact of core stabilization training in collegiate ballet dancers. The results of this study found that core stabilization training associates with significant increases in plank and passé time. This supported the hypothesis that the core stabilization training program would increase muscular endurance and dance ability. However, the training program did not result in increases for all subjects assessed. The standard deviations for the pre-post difference are large. This is due to the fact that some dancers did not improve from the pre to the post-assessments. Due to observations made during the post-assessments, we believe that this decrease may be due to a lack of effort by some individuals. The increase shown in dancers that improved is approximately three times larger than the decreases seen in dancers that did not improve.

The results found in this study support the findings of Koutedakis et al. which examined the association between increased muscular strength and dance ability. Koutedakis et al. determined that increased muscular strength and endurance was associated with increased dance ability (4). Our study showed a relationship between increased muscular endurance through core stabilization and dance ability based on the increased time dancers balanced in the passé assessment. Previous research does not discuss large standard deviations, as found in this study (2, 4, 9). These differences may be due to the experience level of the dancers in the studies. The dancers in this study were in a beginning level ballet class, whereas previous research has focused on moderate to advanced levels (2, 4, 9). Lastly, other research in supplemental dance training incorporates multiple types of training into the program, such as strength and stretching (4, 9). Our study focused solely on one type of training; however, both previous research and

this study showed improvements in dancers. Therefore, future research is necessary to determine the differences between training modalities for dancers.

This study contains a few notable limitations. First, the population used for this study consisted of novice ballet dancers. Therefore, the results are best generalized to a similar population of novice ballet dancers, rather than those of a higher ability. Second, the exercises selected fall into the categories of prone, supine, and lateral core exercise positions; therefore, results must only be generalized to a training program that utilizes theses same positions. Third, the study did not utilize a control group, thus it is a pilot study for the core exercise progressions. The study does not conclusively show that plank and passé endurance increased; they may not be directly related to the intervention utilized.

In conclusion, the 6 week core stabilization program in a beginning ballet student population resulted in statistically significant increases in core endurance and dance ability. Future research would benefit from the use of a control group to more conclusively determine the effects of core stabilization. Also, it would be useful to apply this training program in more advanced ballet classes. Though the increases in ability may not be as large, there could be a more consistent change in these populations. Based on the results of this study, we recommend the incorporation of a core stabilization training program in novice ballet classes. Further research may support the incorporation of core stabilization training into intermediate and advanced ballet classes.

References

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