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The Effect Of 10 Weeks Core Stability Training On Technical And Physical Attributes Of Malaysian Rhythmic Gymnasts

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Abstract
This study was conducted to identify the effect of 10-week core stability training on technical and physical attributes of Malaysian Rhythmic gymnasts. Forty female young rhythmic gymnasts from 2 clubs in Kuala Lumpur (n = 40); (age 8 to 12 years old) were recruited. These subjects were randomly divided into two groups; the experimental group (n = 20) and the control group (n = 20). The experimental group underwent regular training with additional core stability intervention programme and control group they did only regular RG training. Physical and Technical tests for both groups were obtained twice; pre-test and post-test. The paired-sample t-test was used to determine whether there were changes in physical and technical tests between before and after 10 weeks of training session. The results revealed that 10-week core stability training induced significant improvement on the technical (t = -4.7, df = 19, p < .05) and physical (t = -9.4, df = 19, p < .05) attributes of rhythmic gymnasts. These results suggest that 10-week core stability training is an effective and suitable method to improve the technical and physical attributes of Rhythmic Gymnasts.

Keywords: Rhythmic Gymnastics (RG), Core Stability Training, Physical and Technical Tests

Introduction
Rhythmic Gymnastics (RG) is a sporting modality that has been technically developing through alterations of the punctuation code and adaptations in the competition levels, of age group and others. More and more, for those that long for high results, the course becomes more difficult (Zizi et al., 2009). The core has been identified as a key component for functional athletic performance in the field of sports science. The core is referred to as the region of the body that provides an adequate support for upper and lower extremity movements, during athletic performance (Dendas, 2010). Some studies defined core stability as “The ability to control the position and motion of the trunk over the pelvis and legs to allow optimal production, transfer, control of force and motion to the terminal segment in integrated kinetic chain activities (Kibler et al., 2008).

For many strength and conditioning professionals, core stability is considered a key component in training to improve sport performance (Leetun et al., 2004). Many investigators have examined the effectiveness of core training programs on athletic performance levels (Scibek et al., 2001); in each of these studies measures of core stability were also taken before and after training. Although it has been established that focused core training has a positive effect in numerous sports, little is known about the effect in rhythmic gymnastics. Therefore, the purpose of this study was to investigate the effect of core stability training on technical and physical attributes of rhythmic gymnastics performance.

Objectives
I. To compare the significance differences of technical and physical attributes between Pre and Post Intervention.
II. To compare the significance differences of technical and physical attributes between the experimental group and the control group after 10-week of intervention.

Methodology
Subjects
The subjects of this research were chosen from 2 RG club in Kuala Lumpur. A total of 40 subjects (N = 40) were chosen to become the subjects of this research. The subjects were equally divided into two
groups using a random sampling with a draw session. All subjects had picked up a number from a box which contained no.1 or 2 where no.1 is experimental group and no.2 is control group. The experimental group (n = 20) and the control group (n = 20). The experimental group underwent regular training with additional core stability intervention program in 10-week (2 session per week) and control group they did only regular RG training in 10-week (2 session per week). The subject's ages between 8 and 12 years were recruited for the study.

Measurements
In order to assess the physical attributes, sit and reach test (sit and reach box), sit-up test (60 Second Maximum Sit-Up Test), vertical jump (Vertex Vertical Jump Meter), stork stand balance test was used as the instrument of this research. In order to assess the technical attributes, Scissors jump with arm circles, Right-leg balance with free leg in front at horizontal, Pivot passé 360 in passé position to the right with arms at sides with judge scoring used as technical test of this research. Before undergo the test, the subjects were required to carry out a gentle warm up and light stretching exercises focusing on the lower limbs for at least 5 minutes. According to Prentice (2007) the warm up routine increase body core temperature, stretches ligaments and muscles and increase flexibility. Warm up routine has been found to be important in reducing injury and muscle soreness (Prentice, 2007).

Procedure
The all subjects of experimental group were informed and explained that a research entitled “The Effect of 10 Weeks Core Stability Training on Technical and Physical Attributes of Malaysian Rhythmic Gymnasts”. They were fully informed of identified procedures prior to enrolment in the study. According to Sato & Mokha (2009) the total session volume should increase to challenge strength improvement rather than performing the same volume throughout their treatment. Therefore, this study was designed to increase the volume of exercise sessions every 2 weeks (Sato & Mokha, 2009). All subjects in experimental training groups successfully completed the entire 10-week program. After completion of the 10-weeks of core stability training, both subjects from experimental group (n = 20) and the control group (n = 20) were asked to perform post-test using the same physical and technical tests.

Results
There was a significant differences of the technical and physical attributes between the pre and post-test for the experimental group respectively for technical attributes \( t = -4.7, df = 19, p < .05 \) and for physical attributes \( t = -9.4, df = 19, p < .05 \). On the other hand, this study revealed that no significant differences of the technical and physical attributes between the pre and post-test for the control group respectively for technical attributes \( t = -0.6, df = 19, p > .05 \) and for physical attributes \( t = -1.00, df = 19, p > .05 \).

Table 1 shows the independent samples \( t \) - test between the Experimental and Control group on the Technical attributes (post-test), \( p < .05 \). There was a significant differences of the technical attributes between the experimental and control group during post-test \( t = 3.25, df = 38, p < .05 \).

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Diff.</th>
<th>S.E. Diff</th>
<th>( t )</th>
<th>( df )</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group &amp; Control Group</td>
<td>0.77</td>
<td>0.14</td>
<td>3.25</td>
<td>38</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Table 2 shows the independent samples \( t \) - test between the Experimental and Control group on the physical attributes (post-test), \( p < .05 \). There was a significant differences of the physical attributes between the experimental and control group during post-test \( t = 3.30, df = 38, p < .05 \).
Table 2: Independent samples t – test between the Experimental and Control group on physical attributes (post-test), p< .05.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Diff.</th>
<th>S.E. Diff</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>26.7</td>
<td>4.00</td>
<td>3.30</td>
<td>38</td>
<td>0.002</td>
</tr>
<tr>
<td>Control Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The purpose of this study was to determine the effect of 10-week Core Stability Training on Technical and Physical Attributes of Malaysian Rhythmic Gymnasts. The major finding of this study was that the intervention often weeks (2 sessions per week) for the experimental group (n = 20) induced significant differences (t = -4.7, df = 19, p< .05) on technical and (t = -9.4, df = 19, p< .05) on physical attributes of Malaysian Rhythmic Gymnasts. Sato & Mokha (2009) investigated the effects of six weeks of participation in a core strengthening program on running kinetics, lower-extremity stability, and 5000 meter performance in runners. Although the researchers provided evidence of a significant effect on running time in the experimental group after six weeks of training, the core stability test did not significantly influence ground force production and lower-leg stability functions. Kolba (2005) stressed the importance of core stability training for gymnasts, because of the various components of spin and rotation involved in many gymnastic movements.

The result of this study expressed that there was a significant differences of the technical and physical attributes between the experimental and control group during post-test respectively (t = 3.25, df =38, p< .05) and (t = 3.30, df = 38, p< .05). The results supported that core stability training can improve the technical and physical attributes of rhythmic gymnasts well within short period of time (during 10 weeks).

From the result of this study it can be concluded that traditional core stability training is beneficial to gymnasts in terms of enhancing technical and physical attributes, which will be beneficial in performance.

References