

Influence of Practice Time on Absolute and Relative Strength in Pole Dance Fitness Practitioners

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ABSTRACT : This study aimed to analyze the time of practice in absolute and relative strength of women practicing Pole Dance Fitness. The methodology consisted of a sample of 23 (twenty-three) women between 18 (eighteen) and 50 (fifty) years of age, who practiced Pole Dance fitness, with a minimum of three classes performed. The instruments used to collect the tests were the right and left hand dynamometry, lumbar and lower limbs. Also collected were age, body mass and height for BMI (body mass index) analysis. Descriptive statistics were used for the data analysis with mean, standard deviation, minimum and maximum, in addition to the inferential statistic with repeated measures ANOVA and Pearson correlation. The results found did not present significant difference in the initial levels with 194.4kgf, intermediate with 183.9kgf and advanced with 225.7kgf in the absolute force, being with relative strength beginners 2.9kgf, intermediate 3.2kgf and advanced 3.4kgf ($p > 0.05$). We conclude that there is no statistical difference between the three levels of training.

KEYWORDS - Pole Dance, Muscular Strength, Physical Fitness.

I. INTRODUCTION

The regular practice of physical activities and physical exercise has been increasingly sought by the population in recent years, as it provides practitioners with health-related benefits, such as body weight control, physical endurance, muscular strength, aesthetic improvement, and reduced social isolation (Fernandes, 2001). Physical exercise is a systematized practice that enables the human body to improve overall physical fitness through physiological adaptations. In this sense, all forms of physical exercise should be encouraged among the population, aiming to promote improvements in health status and quality of life (Santos, 2002). Thus, the number of new forms of physical exercise has increased in the fitness market, emerging as innovative alternatives for the population. Pole Dance Fitness is an example of these new activities and has attracted an increasing number of practitioners (Lopes, 2016). Pole Dance is a sport modality that has been growing in Brazil and can basically be defined as “dance on the pole” or “bar dance” (Borges, 2015). It requires physical strength from its practitioners, in addition to flexibility and body expression performed on a vertical steel or iron pole (Lopes, 2016). This physical activity became popularly known for being performed in nightclubs or portrayed in films as sensual or erotic body expressions aimed at seduction (Borges, 2015), emphasizing the more sensual side of women through dance performance. However, throughout its history, the perception of Pole Dance has not always been restricted to this view.

The origin of Pole Dance has several perspectives, one of which is directly related to yoga, specifically the practice of Mallakhamb (Parizzi, 2008). Mallakhamb, which means “man of strength,” is a physical activity widely practiced in India and considered a variation of yoga. It uses a vertical wooden pole or ropes, through which practitioners perform movements requiring strength, balance, and flexibility, and has existed since the 17th century (Fernandes, 2012). In the 1920s, in England, Pole Dance gained prominence when it was performed during the main intervals of circus shows. The performance used the poles that supported circus tents. Pole Dance was adopted as a circus attraction under the influence of the Chinese pole by Cirque du Soleil, one of the most internationally recognized circus companies known for its high-quality performances (Cirque du Soleil, 2013). Pole Dance as it is known today began in the 1990s in Canada and the United States (Lopes, 2016). In the 21st century, Pole Dance has developed into different genres, moving beyond eroticism and entering the fitness world, allowing women to practice it regularly and contributing to improvements in quality of life and physical fitness. In the fitness context, it is directed toward acrobatics and the technical execution of Pole Dance and is currently considered a sport (Wilke, 2012).

Exercises performed in this modality contribute to increased upper-limb strength by using body weight as resistance, improving posture, flexibility, motor coordination, and strengthening the body as a whole. In addition, it works the upper limbs — biceps, triceps, back, chest, and shoulders — and the lower limbs — thighs and legs — in a comprehensive manner (Parizzi, 2008). According to Wilke (2016), Pole Dance is known by different names depending on the country or city. It includes approximately four hundred movements and combinations, presenting four different levels proposed by the Brazilian Pole Dance Confederation: basic, intermediate, advanced, and master. However, there is no clearly defined classification for each level. The basic level is where practitioners learn hand, trunk, and limb positions, developing strength, flexibility, and motor skills, preparing the body and establishing the foundation for the subsequent levels (Wilke, 2012). According to Wilke (2012), the intermediate level marks the beginning of acrobatics, where technique becomes essential and involves greater skin adherence and resistance in contact with the vertical pole, requiring a new bodily adaptation. If the student is well prepared at the basic level, he or she will reach the intermediate level with better movement execution and more satisfactory results.

At the advanced level, movement sequences and acrobatic combinations begin. At this level, great abdominal and upper-limb strength become highly evident. The student needs adequate preparation to perform at this level, as it requires extensive technical knowledge and strength for complex acrobatics (Wilke, 2012). The master level requires more strength than all previous levels, as well as considerable flexibility, endurance, and technical ability to execute the movements, since they demand extensive practice and training. At the final stages of the levels, the acrobatics become more complex, thus requiring substantial muscular preparation and technical proficiency from the practitioner (Wilke, 2012). The demand for Pole Dance as a form of physical exercise has been growing and developing increasingly in Brazil; however, scientific production on this modality remains scarce (Lopes, 2016). In our view, studies on this exercise modality are essential to determine the real health benefits of this physical activity for its practitioners. According to Komi (2006), muscular strength is the maximum force or torque that a muscle or muscle group can generate at a specific or determined velocity. For Knuttgen (1987) and Kraemer (2009), strength is the maximum amount of tension that a muscle or muscle group can produce in a specific movement pattern performed at a given velocity. Muscular strength is a physical capacity; therefore, individuals are born with it and develop it throughout life. Through training, everyone can become stronger as they overcome the stimuli applied during exercise. The present study used two types of strength for analysis: relative strength and absolute strength. Relative strength refers to the force produced in relation to body weight, whereas absolute strength, which may also be called pure strength, is the maximum capacity an individual has to overcome resistance; that is, the maximum amount of weight or load that he or she can lift in a specific body movement. Thus, absolute strength refers to the force produced independently of body weight. Considering the above, the objective of this study is to verify whether strength improves according to practice time among women who practice Pole Dance Fitness as a physical exercise aimed at quality of life.

II. METHOD

This research was approved by the Research Ethics Committee of the State University of Central-West Paraná (UNICENTRO). The participating volunteers signed the Informed Consent Form, agreeing to participate in the study and to the instruments used for data collection. The sample consisted of 23 female participants, aged between 18 and 50 years, who had been practicing Pole Dance Fitness for at least three completed classes. The women included in this study were volunteers from a Pole Dance studio in the city of Guarapuava, Paraná, Brazil. They were divided into three groups: beginners, intermediate practitioners, and advanced/master practitioners. The beginners had between 4 weeks and 8 months of practice, the intermediate practitioners had between 2 and 10 months, and the advanced practitioners had between 18 and 108 months of practice. This classification was performed by their instructor based on the technique acquired by each volunteer. Data collection was performed before the beginning of practice, according to each participant's class schedule. Three tests were performed to analyze the absolute and relative strength of the practitioners. The selected tests were right- and left-hand grip dynamometry, lumbar traction dynamometry, and lower-limb traction dynamometry. The instruments used were an E-CLEAR electronic hand dynamometer with a capacity of 100 kgf and a CROWN traction dynamometer with a capacity of 200 kgf, used to perform the lumbar and lower-limb traction tests. Data collection also included age, body mass, height, and practice time. Practice time, together with name and date of birth, was collected through questionnaires. Body mass was measured using an OMRON HBF-514C scale. The participants were wearing light clothing, such as gym shorts and a top, and were barefoot, without socks. Height was measured using a measuring tape, with no specific brand, fixed to the wall, so that the participant stood with her back to the tape and body upright.

For the handgrip test, participants were asked to sit comfortably on a chair with their spine upright and without supporting their arms. The purpose and procedures of the test were then explained, including a demonstration of how to hold the instrument. The dynamometer was then handed to the participant, with the necessary corrections made by the evaluator (Soares, 2012). The participant was instructed to hold the instrument with the arm positioned at a 90° angle, the forearm in a neutral position with slight extension, and the handle placed at the level of the middle phalanges of the fingers (Mathiowetz et al., 1985). Before the participant began the test, the evaluator checked whether the instrument was set to zero. The test was first performed with the right hand and then with the left hand, with a three-minute rest interval for each hand. To prevent the instrument from falling, the evaluator assisted in holding the dynamometer during the test. In the lumbar traction test, the participant was barefoot and positioned on a platform containing an attached load cell and a lever. She remained standing with her spine straight, arms extended, and hands resting on the anterior region of the thighs to ensure correct positioning for the traction movement.

The volunteer was then instructed to flex the trunk and knees to perform the test. Holding the handle with both hands, the participant was asked to exert maximum traction force on the handle, perpendicular to the platform, without allowing the handle or hands to contact any other part of the body (Soares, 2012). Each participant performed an initial trial for familiarization with the test, followed by the recorded assessment. During test execution, the dynamometer pointer was placed at zero, and the participant was instructed to apply the greatest possible force during spinal extension, using the muscles of the lumbar region (Guedes and Guedes, 2016). For the lower limbs, the same testing method was used; however, the lower limbs remained extended throughout the entire procedure. Statistical analysis was performed using descriptive parameters, including mean, standard deviation, minimum, and maximum values. To study the relationship between variables, inferential statistics were used, including one-way repeated-measures ANOVA and Pearson's correlation test. All analyses were performed using SPSS software, version 20, and the significance level was set at $p < 0.05$.

III. RESULTS AND DICUSSION

Table I, presents the characterization results of the Pole Dance Fitness practitioner groups: beginners (12), intermediate practitioners (5), and advanced practitioners (6). The data presented include the mean and standard deviation, minimum and maximum values for age, height, body mass, and body mass index (BMI). In addition, the comparison among the three practice levels is presented based on the analysis of variance.

Table I. Characteristics of the evaluated participants and comparison among the three training levels

Variable	Group	Mean	Standard Deviation	Minimum	Maximum	p
Age	Beginners	32.1	10.7	50.0	20.0	0.887
	Intermediate	30.0	8.6	39.0	21.0	
	Advanced	30.0	10.2	47.0	18.0	
Height	Beginners	1.6	0.06	1.7	1.4	0.185
	Intermediate	1.6	0.05	1.6	1.5	
	Advanced	1.6	0.04	1.7	1.6	
Body Mass	Beginners	66.6	13.4	89.1	48.1	0.319
	Intermediate	58.7	5.6	67.2	51.6	
	Advanced	68.2	7.5	82.8	61.7	
BMI (kg/m ²)	Beginners	25.8	5.04	33.6	20.0	0.221
	Intermediate	22.1	1.1	23.8	21.1	
	Advanced	24.7	1.7	27.3	22.1	

Tested by one-way ANOVA.
Significance level set at $p < 0.05$.

The mean age of the practitioners in all levels did not show significant differences; however, the beginner group presented a higher age than the other groups. Height, body mass, and BMI also did not show significant differences. Nevertheless, the advanced group was positioned between the recorded values, considering that its BMI was lower than that of the beginner group and higher than that of the intermediate group. Table II presents the results obtained in the right- and left-hand grip dynamometry, lumbar traction, and lower-limb traction tests.

Table II. Comparison among the three training levels in the dynamometry tests.

Variable	Group	Mean	Standard Deviation	Minimum	Maximum	p
Right Handgrip	Beginners	28.4	5.2	36.6	21.3	0.186
	Intermediate	27.3	1.7	29.1	24.8	
	Advanced	33.2	8.6	46.0	21.2	
Left Handgrip	Beginners	26.4	5.6	36.3	18.3	0.085
	Intermediate	25.5	2.5	28.2	21.6	
	Advanced	32.8	8.5	49.8	26.8	
Lumbar Traction	Beginners	70.0	12.9	90.0	55.0	0.350
	Intermediate	69.4	8.5	76.0	56.0	
	Advanced	79.6	18.9	106.0	50.0	
Lower-Limb Traction	Beginners	69.6	13.8	95.0	51.0	0.167
	Intermediate	61.8	12.7	78.0	45.0	
	Advanced	80.0	19.9	107.0	61.0	

Tested by one-way ANOVA.
Significance level set at $p < 0.05$.

The practitioners presented the following mean values for right-hand grip dynamometry: 33.2 kgf for the advanced level, 27.3 kgf for the intermediate level, and 28.4 kgf for the beginner level, with no significant difference. For the left hand, the mean value was 26.4 kgf for beginners, 25.5 kgf for intermediate practitioners, and 32.8 kgf for advanced practitioners, also with no significant difference. In lumbar dynamometry, the mean value was 70.0 kgf for beginners, 69.4 kgf for intermediate practitioners, and 79.6 kgf for advanced practitioners. In lower-limb dynamometry, the mean values were 69.6 kgf for beginners, 61.8 kgf for intermediate practitioners, and 80.0 kgf for advanced practitioners, also with no significant difference. The advanced practitioners presented higher mean values in all tests performed compared with the other levels, although the differences were not statistically significant. Table III presents absolute strength, which was obtained by summing the four tests: right-hand grip, left-hand grip, lumbar traction, and lower-limb traction. Relative strength data were obtained by dividing absolute strength by the participant's body mass.

Table III. Comparison of absolute and relative strength among the three training levels.

Variable	Group	Mean	Standard Deviation	Minimum	Maximum	p
Absolute Strength	Beginners	194.4	32.1	243.7	148.6	0.134
	Intermediate	183.9	24.1	208.0	147.4	
	Advanced	225.7	48.5	308.8	179.4	
Relative Strength	Beginners	2.9	0.6	3.9	2.4	0.530
	Intermediate	3.2	0.6	4.0	2.5	
	Advanced	3.4	0.9	4.8	2.1	

Tested by one-way ANOVA.
Significance level set at $p < 0.05$.

Regarding absolute strength, the results did not show a significant difference. Relative strength also did not show significant differences among the mean strength values of the volunteers. Thus, the data demonstrate that the groups were similar in relation to the results of the tests performed. Table IV presents the Pearson correlation between right-hand grip, left-hand grip, lumbar traction, lower-limb traction, absolute strength, and relative strength associated with the practice time of the participants.

Table IV. Association between strength variables and practice time.

Variable	Practice Time
Right Handgrip	0.57
Left Handgrip	0.63
Lumbar Traction	0.58
Lower-Limb Traction	0.57
Absolute Strength	0.66
Relative Strength	0.55

Tested by Pearson's correlation.

The correlations presented in Table IV demonstrate a positive association between strength variables and practice time. Therefore, it is understood that the longer the practice time, the higher the strength variables tend to be. Absolute strength showed the highest correlation with practice time, presenting a moderate correlation of 0.66. The other variables also showed moderate correlations. The present study demonstrated the strength acquired over time in the muscular function of women who practice Pole Dance Fitness. Although the study did not show large differences among the levels of progression in the sport modality, the participants demonstrated strength development across the different groups of practitioners, indicating that the results may be considered positive.

The study also showed a considerable convergence in age among the participants. According to Andrade et al. (1995), despite the regular practice of physical activity, women present a progressive decline in strength values and in other physical capacities, such as agility, with advancing age. According to the literature, strength training is essential for achieving higher strength levels (Tsolakis et al., 2006; Kraemer et al., 2003). In their studies, these authors found that properly periodized strength training results in increased strength values. According to Szymanski et al. (2006), higher levels of handgrip strength can be achieved through specific training for the wrists and forearms, which may represent an important differential in sports such as judo, volleyball, tennis, table tennis, and also Pole Dance, modalities in which manual strength is highly

Important. When comparing the present study with the study by Guedes et al. (2013), which compared female individuals who trained more frequently with women who trained less frequently, the authors stated that lumbar strength values of 62.40 tend to increase significantly over practice time in individuals who train more consistently. According to the study by Eichinger et al. (2016), which analyzed lumbar strength in sedentary women aged between 18 and 45 years, the mean value was 48.50 kgf, lower than the lumbar traction values observed in the present study, in which the women presented greater strength. Udermann et al. (2004), in turn, conducted a study based on isometric lumbar extension strength in 60 healthy individuals of both sexes, with a mean age of 22.15 years, using the Backup™ dynamometer. They found that mean isometric lumbar extension strength ranged from 25.37 to 16.06 kgf for women. However, discussing the results in comparison with both studies is difficult due to differences in the methodological procedures employed, since the study by Udermann used a dynamometer with several pelvic stabilization mechanisms.

In the study by Filho et al. (2012), which analyzed strength in physically active middle-aged and elderly women participating in the group “Physical Activity and Health Within Everyone’s Reach,” lumbar strength values were 44.6 for middle-aged women and 33.1 for elderly women. Women in both age groups were classified as 45% below the desired scores. Although that study was conducted with women from an older age group than the present study, the test performed was the same, which makes it possible to observe the difference between the values presented. The discussion regarding the lower limbs was difficult. Although lower-limb dynamometry is a common test because it is easy to apply, low-cost, and has good reliability, it is still little used in Brazilian studies, especially with emphasis solely on lower-limb strength analysis, making it a scarce method in the literature (Meereis et al., 2013).

IV. CONCLUSION

Based on the analysis presented in this study, it can be concluded that the absolute and relative strength of women who practice Pole Dance Fitness did not show significant differences among beginner, intermediate, and advanced levels. The results found in the tests in relation to practice time were minimal, and the analysis did not show statistically significant differences. Thus, through this study, it was observed that there are no differences in strength among the levels existing in Pole Dance Fitness. This research contributes a new study on Pole Dance to the literature, since studies on this modality remain scarce. Further studies in this area would be interesting, especially those related to strength among different levels of Pole Dance practice, such as studies analyzing strength in specific movements and acrobatics or even the progression within the levels reached by practitioners.

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