Research Paper Sport Science

Adolescents' Knowledge About The Contraindications of Muscle Weakness Due Central Fatigue, Peripheral Fatigue And Lactic Acid As Health Education Strategy In Lifestyle Management

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ABSTRACT

This study was to assess adolescents' knowledge about the contraindications of muscle weakness due central fatigue, peripheral fatigue and lactic acid, cased at University Secondary School, Njala. One hundred and twenty participants (n=120) were sampled with mean age of 19.5±5.5 ranged from 14-25 years using the stratified random sampling. Variables were signified using One-sample t-Test. Analysis from the test shows significant difference in scores for all tested variables tabled in 2, 4 and 6 with pre-test and post-test t-scores of (7.052-&-16.687); (5.710-&-16.293) and (4.984-&-11.953), @ *p<0.000, **p<0.001, ***p<0.002 and ****p<0.004. It is concluded that, there was significant difference between pre-test and post-test scores for all tested variables as evidenced also in their percentage responses, frequencies and 95% confidence interval difference. It is recommended that; health education be introduced in the schools' curriculum for teaching lifestyle management to pupils.

KEYWORDS Muscle Weakness, Central Fatigue, Peripheral Fatigue, Lactic Acid

Introduction

Muscle weakness is a lack of muscle strength that can be linked to low levels of potassium and other electrolytes within muscle cells. It occurs in neuromuscular junction disorders, a condition that can be referred to as either true or perceived muscle weakness. True muscle weakness (or neuromuscular weakness) is a primary symptom of a variety of skeletal muscle diseases, a condition where the force exerted by the muscles is less than would be expected, as in the case of muscular dystrophy and inflammatory myopathy, Marx, J. (2010). Perceived muscle weakness (or non-neuromuscular weakness) describes a condition where a person feels more effort than normal is required to exert a given amount of force but actual muscle strength is normal, as in the case of chronic fatigue syndrome, Enoka, R. M. et al. (1992). In some conditions, such as myasthenia gravis, muscle strength is normal when resting, but true weakness occurs after the muscle has been subjected to exercise. This is also true for some cases of chronic fatigue syndrome, where objective post-exertion muscle weakness with delayed recovery time has been measured and is a feature of some of the published definitions, Paul, L., et al. (1999), McCully, K. K., et al. (1999), De Becker, P., et al. (2000), De Becker, P., et al. (2001), Carruthers, B. M., et al. (2003) & Jammes, Y., et al. (2005). Muscle weakness can also be classified as either "proximal" or "distal" based on the location of the muscles that it affects. Proximal muscle weakness affects muscles closest to the body's midline, while distal muscle weakness affects muscles further out on the limbs. Proximal muscle weakness can be seen in Cushing's syndrome and Hyperthyroidism. The severity of muscle weakness can be classified into different "grades" based on criteria, Hugue, O. (2008) & Richard, R. (1996); the grade zero indicates no contraction or muscle movement; grade one indicates trace of contraction, but no movement at the joint, whiles grade two shows movement at the joint with gravity eliminated, with grade three pointing at movement against gravity, but not against added resistance, grade four also shows movement against external resistance with less strength than usual and grade five indicating normal strength, Hugue, O. (2008) & Richard, R. (1996). This study only emphasized on the assessment of adolescents' knowledge about the contraindications of muscle weakness due central fatigue, peripheral fatigue and lactic acid as health education strategy in lifestyle management, cased at University Secondary School Njala, Southern Sierra Leone.

Materials and Methods

Participants:

The researcher interviewed mainly high school pupils with a sampled number of one hundred and twenty (n=120), with a mean age of 19.5±5.5 within the range of (13-25) in years, were selected using the stratified random sampling. Also stratified were 58% (n=70) participants from Pure Science-to-General Science; 42% (n=50) from Social Science-to-Applied Art; 29.2% (n=35) from SSS-One-to-Two; and 70.8% (n=85) from SSS-Three-to-Four.

Measuring Instrument:

The survey questionnaire design was adopted for the study. The restructured but validated adolescents' knowledge level about health education strategy questionnaire (AKHESQ) was adopted as an instrument for testing the parameters formally used by Bebeley, et al. (2016), which was pre-tested on sixty pupils (n=60) from UCC Secondary School Bo, using the test retest ANOVA technique with high intra-class correlation coefficient reliability of 0.89-to-0.99.

Procedure:

The one hundred and twenty participants (n=120) were instructed to mark '0-for-No' and '1-for-Yes' during pre-test, and for post-test after 10 minutes' health education briefing regarding their knowledge level on the variables under investigation on the school's premise adopting the classroom face-to-face technique.

Analysis:

The frequency table, percentage, standard deviation, mean, 95% confidence interval difference and One-Sample t-Test, were used to compute, analyze and compare the results from the tested variables. The results were tested @ 2-tailed significance of *p<0.000; **p<0.001; ***p<0.002 and ****p<0.004.

Results:

Table 1: Adolescents' Knowledge about Muscle-Weakness Due Central-Fatigue [n=120]

Do you Know that Muscle-Weakness Due Central-Fatigue can be Linked to:	Pre-Test Scores	%	Post-Test Scores	%
Energy Deprivation?	42	35.0	78	65.0
Decreased Force Output?	58	48.3	62	51.7
Less Nerve-Based Motor Command?	30	25.0	90	75.0
Muscular Dystrophy?	25	20.8	95	79.2
Inflammatory Myopathy?	28	23.3	92	76.7
Neuromuscular Junction Disorders?	31	25.8	89	74.2
TOTAL	214	178.2	506	

Table 2: One-Sample t-Test results of Muscle-Weakness Due Central-Fatigue [n=120]

Variables	Freq.	%	t-Test Scores	95%-CID		2-Tailed Sig.	Mean Scores	Std. Dev.	df
				Lower	Upper				
Pre-test	214	29.7	7.052	22.6330	48.6003	0.001	35.6667	12.37201	5
Post-test	506	70.3	16.687	71.2997	97.2670	0.000	84.3333	12.37201	5
TOTAL	720	100	(n=6)						

Note: 95%-CID = 95% Confidence Interval Difference; t-Test Value=0.05

Table 3: Adolescents' Knowledge about Muscle-Weakness Due Peripheral-Fatigue [n=120]

Do you Know that Muscle-Weakness Due Peripheral-Fatigue can be Linked to:	Pre-Test Scores	%	Post-Test Scores	%
Physical Inability to Work?	45	37.5	75	62.5
Insufficient Energy Supply?	40	33.3	80	66.7
Less Metabolites to Contract Muscles?	20	16.7	100	83.3
Increased Energy Demand?	37	30.8	83	69.2
Contractile Dysfunction?	35	29.2	85	70.8
Synaptic Fatigue?	10	8.3	110	91.7
TOTAL	187	155.8	533	444.2

Table 4: One-Sample t-Test results of Muscle-Weakness Due Peripheral-Fatigue [n=120]

Variables	Freq.	%	t-Test Scores	95%-CID		2-Tailed Sig.	Mean Scores	Std. Dev.	df
				Lower	Upper				
Pre-test	187	26.0	5.710	17.1089	45.1244	0.002	31.1667	13.34791	5
Post-test	533	74.0	16.293	74.7756	102.7911	0.000	88.8333	13.34791	5
TOTAL	720	100	(n=6)						

Note: 95%-CID = 95% Confidence Interval Difference; t-Test Value=0.05

Table 5: Adolescents' Knowledge about Muscle-Weakness Due Lactic-Acid [n=120]

Do you Know that Muscle-Weakness Due Lactic-Acid can be Linked to:	Pre-Test Scores	%	Post-Test Scores	%
Sub-Optimal Aerobic Metabolism?	15	12.5	105	87.5
Accumulation of Lactic Acid?	52	43.3	68	56.7
Acidic Anaerobic Metabolic By-Products?	18	15.0	102	85.0
Burning Sensation?	42	35.0	78	65.0
Decreased Motor Activity?	56	46.7	64	53.3
Muscle Contraction Inhibition?	29	24.2	91	75.8
TOTAL	212	176.7	508	423.3

Table 6: One-Sample t-Test results of Muscle-Weakness Due Lactic-Acid [n=120]

Variables	Freq.	%	t-Test Scores	95%-CID		2-Tailed Sig.	Mean Scores	Std. Dev.	df
				Lower	Upper				
Pre-test	212	29.4	4.984	17.0864	53.4803	0.004	35.3333	17.33974	5
Post-test	508	70.6	11.953	66.4197	102.8136	0.000	84.6667	17.33974	5
TOTAL	720	100	(n=6)						

Note: 95%-CID = 95% Confidence Interval Difference; t-Test Value=0.05

Discussion:

Substrates produce metabolic fatigue by being depleted during exercise, resulting in a lack of intracellular energy sources to fuel contractions. In essence, the muscle stops contracting because it lacks the energy to do so, Kolata, G., et al. (2008). This study only focuses on adolescents' knowledge about the tested variables for contraindications of muscle weakness due central fatigue, peripheral fatigue and lactic acid. The finding shows 29.7% (n=214) frequency level of respondents' knowledge during pre-test with t-score of 7.052, and 70.3% (n=506) post-test with t-score of 16.687 for central fatigue muscle weakness recorded in table 2; 26.0% (n=187) pre-test with t-score of 5.710, and 74.0% (n=533) post-test with t-score of 16.293 for peripheral fatigue recorded in table 4; and 29.4% (n=212) pre-test with t-value of 4.984 and 70.6% (n=508) post-test with t-value of 11.953 for lactic acid recorded in table 6. The significant difference in t-scores and 95% confidence interval difference displayed between pre-test and post-test results, clearly pointed out the need for introducing the discipline of health education in high schools, in other to help disseminate through teaching the contraindications of muscle weakness with respect to the tested variables. Also displayed, is the individual scores and percentages for pre-test and post-test in tables 1, 3 and 5. However, in similar research, Kolata, G., et al. (2008) reported that, new research from scientists at Columbia University suggests muscle fatigue is caused by calcium leaking out of the muscle cell. In addition, an enzyme proposed to be activated by this released i.e. calcium, eats away muscle fibers. According to Kolata, G., et al. (2008), substrates within the muscle generally serve to power muscular contractions include molecules such as adenosine triphosphate (ATP), glycogen and creatine phosphate. Kolata, G., et al. (2008) further stated that, ATP binds to the myosin head and causes the 'ratchetting' that results in contraction according to the sliding filament model. Creatine phosphate according to Kolata, G., et al. (2008), stores energy so ATP can be rapidly regenerated within the muscle cells from adenosine diphosphate (ADP) and inorganic phosphate ions, allowing for sustained powerful contractions that last between 5–7 seconds. In conclusion, Kolata, G., et al. (2008) stated that, glycogen is the intramuscular storage form of glucose, used to generate energy quickly once intramuscular creatine stores are exhausted, producing lactic acid as a metabolic byproduct.

Conclusion:
This study was conducted with the focus of assessing adolescents' knowledge level about contraindications of the tested variables. Based on the results, it is concluded that, there was significant difference between pre-test and post-test scores for all tested variables as evidenced in their percentage responses, 95% confidence interval difference and calculated t-values.

Recommendation:
It is strongly recommended that, health education as a subject be introduced in high schools to help in teaching and learning of lifestyle management for pupils, and that more time be allotted on the teaching timetable for health education activities if implemented.

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