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Effect of Biomechanical Movement on Concentration of Blood Glucose and Lipids in Professional Athletes

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ABSTRACT

The aim of this study was evaluation of effect of biomechanical movements on concentration of blood glucose and lipids in professional athletes of kung fu toa 21 and control samples. Both groups preformed 25 sport tasks based on exercise program of Farfan and Gracovetsky in two independent 15 min activity at submaximal level (HR max 150 ± 13.5) and after performing sport program at maximal level (HRmax 195 ± 4) they performed exhaustion activity. Blood samples were collected from both groups before and after exercise based on standard methods.

Based on our experiment blood glucose in professional athletes showed lower concentration in comparison with controls significantly, 101±1 mg/dl and 109±1.9 mg/dl, respectively in resting state (P<0.001). After performing biomechanical movements in submaximal state concentration of blood glucose did not show any considerable alteration (P>0.5). But in maximal state showed a considerable alteration, 172±10 mg/dl and 119±2 mg/dl, respectively (P<0.001).

Concentration of blood TG in submaximal state before and after 15 minutes activity showed an increase in controls(P<0.001 in before exercise and P>0.5 after submaximal activity) but exhaustion state did not show any considerable alteration(p>0.5). Blood cholesterol and LDL-C showed a considerable increase in all three states in controls(p<0.05). HDL-C in both group before exercise and in submaximal state did not show any considerable alterations(p>0.5) but after maximal state showed an increase in professional athletes(p<0.01). This result showed that physical activity based on Farfan et al. methods alters the concentration of blood TG and glucose in both groups considerably. These alterations probably regulates by glucose hypothalamo-hypophyses system and adrenal glands through neurohomoral pathway.

KEY WORDS: Farfan biomechanical movements, glucose, lipoproteins.

INTRODUCTION

Several investigations have been shown that Glucose consumption increases during exercise (19, 20). Sartorious muscle of frog after excitation (1 milliamper per second) during 20-30 minutes did not show any increase in carbohydrate transportation with in muscle but increased level of G6P, F1,6DP and lactate returned to it's normal level . Rate of blood circulation during electric excitation and physical exercise within 20 minutes increased up to 8o to 100 milliliter per minute which leads to increase of oxygen consumption in muscle up to 10% (9).

A . P Kasa-tkin et al. showed that increased consumptions of blood glucose lead to decrease in insulin and increase in secretion of anti insulin hormones. So glucose from liver source release to blood circulation and blood glucose remains stable during endurance exercise. Carbohydrate and lipids are main energy sources of active muscle and severity of physical activity affects consumption of these energy sources (20).

Lipid degradation increase during regular physical activity and total cholesterol concentration of blood returns to its normal level. Aerobic long term physical activity increase the sensitivity of cells to insulin which leads to decrease of insulin level in blood circulation (13, 14, 19, 20). Regular physical activity leads to hyper sensitization of adipose tissue to glucocorticoids and this can probably interpreted the using of lipid sources by the effect of hormonal alterations (16, 18).

Several investigations on mice have been showed that systematic muscle activities in aerobic exercise in mice increase lipase activity of adipose tissue and lipid transportation in muscles (7,12, 13, 14, 17, 18).

Results from study of analysis of the mechanism of hearing, vision and the role of epiphyses in physical activity and the regulation of rabbit biorhythm showed that after short term physical exercise in rabbit leads to increase of blood glucose but long term physical exercise decrease blood

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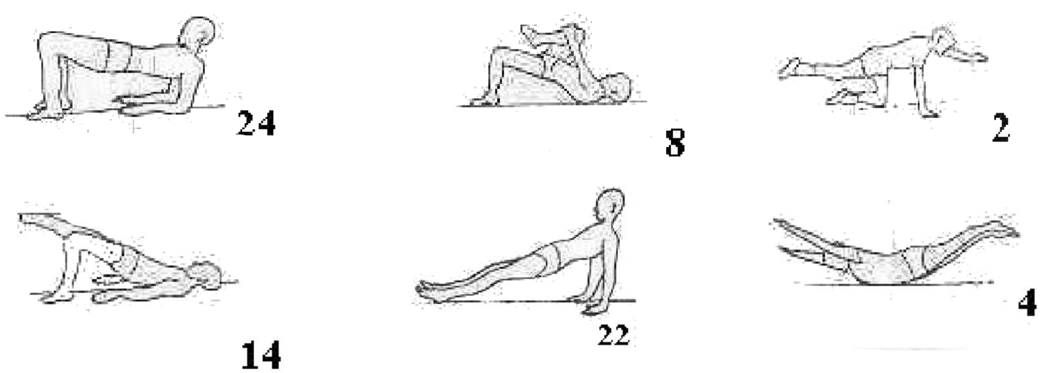
glucose. Muscle adaptation due to regular physical activities highlights the role of epithalamo-hypothalamous system, hypophyses, and adrenal glands (19, 20).

An investigation on professional and non professional skier showed that the group of skier who had muscle adaptation in top level in addition to performing the better physical exercise, quality of consumption and guidance of energy (storage form) were in better condition than nonprofessional group (9, 11). Several investigations on male old mice which performed physical activity in water (28-30ºC) revealed that the secretion of corticotrophin increased after 30 minutes and the secretion of ACTH from hypophyses and ascarabin acid from adrenal gland showed a decrease within 1.5 hours which revealed that performing ling term physical activities leads to increase of secretion of glucocorticoid hormones from adrenal glands under hypothalamus system and the response of adenohypophyses , then leads to decrease of cytosolic hormones during exhaustion state (15, 20).

MATERIAL AND METHODS

This investigation was performed in two groups in which 11 professional athletes (kung fu toa 21) and non-professional persons (as control) with the range of 26.1 ± 1.8 years old and 24 ± 0.2 BMI. The professional groups performs kung fu toa 21 more than 4 years (6 hours per week). Both groups perform 25 sport tasks with 1 hour interval based on Farfan and Gracovetsky program (21). Both two groups participated in two exercise program, 15 min submaximal physical activity (HR max 150 ± 3.5), then in other program until exhaled (HR max 195 ± 4) with 50 minutes interval. Blood samples were collected in fasting state and blood parameters were determined using stometroven (aweroncc, USA) and pars azma kit (Iran) in biochemistry laboratory and blood glucose was determined by enzymatic methods (gop, tap) (10).
A sample of biomechanical movement



RESULTS

In this investigation, the effect of biomechanical movement on blood parameters (FBS, TG, Total cholesterol, LDL-C, HDL-C) were determined in two groups of professional and non-professional athletes before and after 15 minutes submaximal and exhaustion exercise. Data was shown in table 1 and figure 1. Blood glucose was determined 101 ± 1.02 mg/dl before biomechanical movement 107_0.9 mg/dl after 15 min submaximal activity and 172 ± 10.6 mg/dl after exhaustion state. In other words blood glucose increased considerably after these two activity programs in professional athletes ($p<0.001$).

In the case of non-professional athletes, blood glucose was 109 ± 1 mg/dl before activity, 106.5 ± 2.5 mg/dl after 15 minutes submaximal activity and 119 ± 1.7 mg/dl after exhaustion state. Blood glucose after 15 min submaximal biomechanical movement did not show any considerable alteration in non professional group ($p>0.5$). Two groups of samples before activity and in exhaustion step showed considerable increase in blood glucose ($p<0.001$) but in submaximal activity (15 minutes) did not show any considerable alteration in blood glucose ($p>0.5$).

As it has been mentioned in figure 2 and table 1 TG of control samples in the steps of before and after submaximal activity were greater than professional groups ($p<0.05$) but there was not any considerable alteration in the step of exhaustion in TG in both groups ($p>0.1$) . Data from table 1 and figure 3 did not show any alterations in total cholesterol after 15 minutes biomechanical movement and exhaustion step comparing with before activity ($p<0.001$) but did not show any considerable alteration in non professional athletes ($p>0.2$). Total cholesterol showed significant alterations in both group before activity, 15 minutes submaximal activity and exhaustion activity which significantly were greater than non professional athletes ($p<0.05$). LDC-C was significantly greater than professional group in those three steps ($p<0.02$). HDL-C did not show any significant alteration. In two groups before activity and after submaximal activity but in exhaustion step showed a significant increase in professional group ($p<0.01$). Based on our results 15 minutes submaximal biomechanical movement and exhaustion activity lead to significant alteration in blood components. Short and long term physical activities lead to involvement of carbohydrate and lipid sources in energy cycle.

DISCUSSION

The results showed that regular biomechanical movements for at least 4 years (6 hours per week) leads to blood glucose lower than nonprofessional group ($p<0.001$). The results from references 7, 14 showed that long term physical activities increase the sensitivity of cells to insulin which leads to decrease in blood glucose in resting state (7, 14). These exercises increase blood glucose in professional group during maximal activity in comparison with control ($p<0.001$) which correlates with the result from investigation of Noorbakhsh et al that showed FBS as an indicator of coronary heart factors during physical activity increases(2). On the other hand, the maintenance of the normal level of blood glucose is necessary for brain activity which is the main fuel supply. Upon decreasing of blood glucose level, Ep, cortisol, and glucagon lead to degradation of liver glycogen leading to release of glucose into blood circulation and upon increasing of blood glucose, glucose stores in liver in the form of glycogen. During physical activity, the concentration of blood glucose alters which depends on the type and duration of physical activity (1).

The other considerable result was the alteration of blood glucose in submaximal and maximal states comparing to resting state in professional and nonprofessional groups. Referring to table 1 a considerable increase was shown in blood glucose in maximal activity in both group comparing to it's resting state ($p<0.001$) which correlates with results from the references 1, 9 , 19, 20. The difference in blood glucose in sub-maximal activity (15 minutes) in professional group was significant ($p<0.001$) but in nonprofessional group showed an increase in blood glucose, unsignificantly ($P >0.2$) which correlates with results from references 11, 9 that showed an adaptation of professional skiers in storage and release of energy comparing with nonprofessional athletes (9, 11).

Maximal activity showed significant increase in both groups comparing with its resting state. This finding did not show any correlation with the result of Aliyev et al which showed a decrease in blood glucose during exhaustion activities in mice (20). Probably the reason of the differences between results is the interpretation of Dr. Sandgol which expressed that cortisol, epinephrine, glucagons lead to increase of blood glucose significantly during physical activity or the reason is that human is more intelligent in adaptation of storage of energy than animals and in top level vital potential is able to announce the exhaustion of nervous system not similar to animals which experience the real exhaustion and this advantage of human leads to cope with in Sevier conditions and activities (1). On the other hand the duration of exhaustion state in professional group was $18:31 \pm 2:8$ and in nonprofessional group was $14:59 \pm 00:0.6$ and along with higher blood glucose in professional than nonprofessional group confirmed other research hypothesis. The level of TG in submaximal and maximal activity were not significantly higher than its resting state in both groups ($p>0.5$). TG level between maximal activity and submaximal activity did not show any significant different in both groups ($p>0.5$) which correlates with the results from references 33, 35, 36 which showed that one session physical activity is not able to change blood TG significantly. TG in blood samples of professional group in resting state and 15 minutes submaximal activity was lower than nonprofessional group significantly($p<0.05$) which correlates with results from the investigation of martin Haskel and Wood (6-26) .

The results did not show any significant difference in TG between two groups during exhaustion activity ($p>0.1$). In other words, TG increased in professional group because of adaptation in TG consumption, dominancy of aerobic system based on metabolism neediness and decreased in nonprofessional group because of consumption of blood TG. Based on results in table 1 and figure 3, 4 cholesterol and LDL-C in professional group blood samples showed a significant decrease in resting state comparing with nonprofessional group ($p<0.001$). This finding correlates with results from wasakari et al (7, 10). This finding also showed that continuous sport activity will be able to decrease both two high risk factor, cholesterol and LDL-C, significantly which are an important role in coronary heart disease (49, 50).

The result from submaximal and maximal activity also showed a significant decrease in cholesterol and LDL-C in both groups ($p<0.001$).

Figure 1

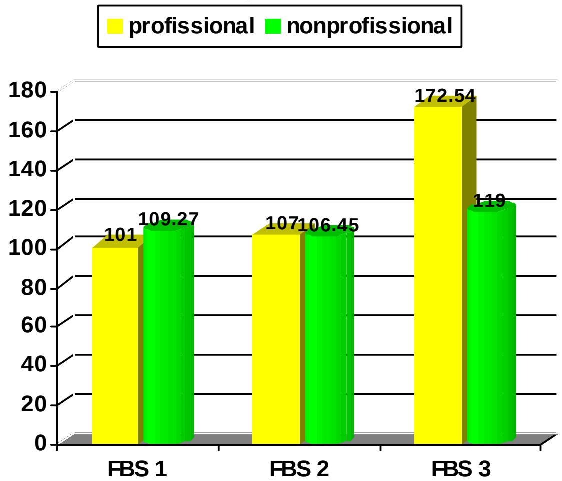


Figure 2

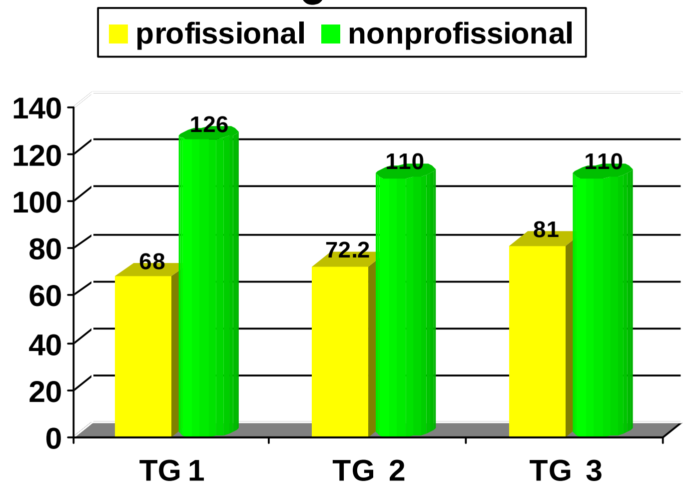


Figure 3

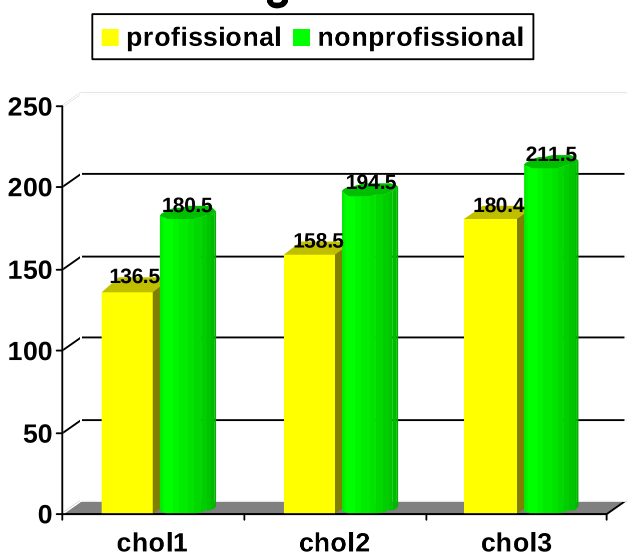


Figure 4

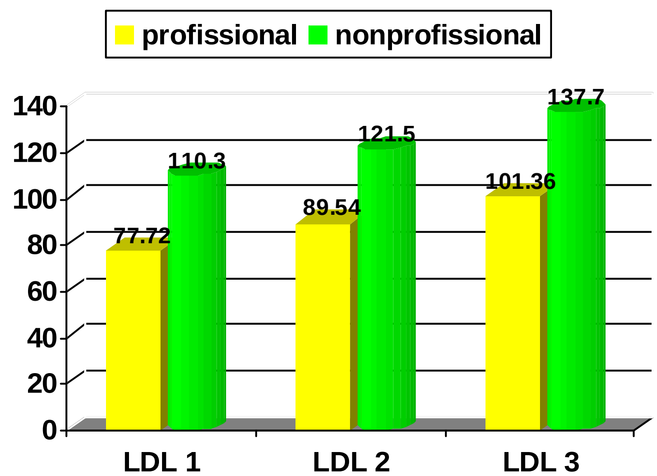
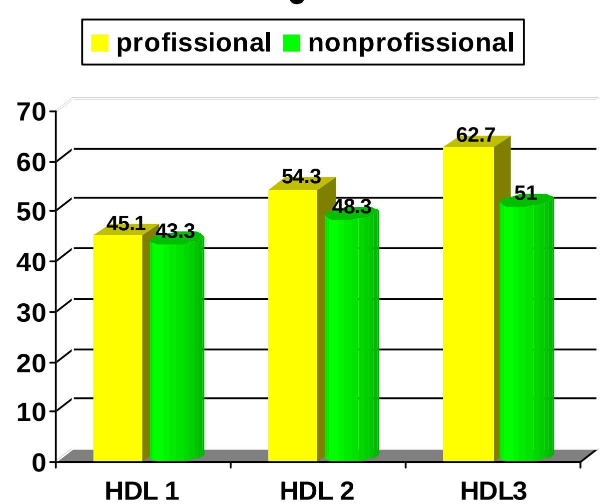


Figure 5



On the other hand the level of cholesterol and LDL-C between submaximal and maximal activity showed a significant increase comparing with resting state and maximal activities ($p<0.001$) which showed correlation with results of statery et al (51) but the cholesterol and LDL-C level in nonprofessional group did not show any significant differences among resting submaximal and maximal activities ($p<0.2$) which correlates with some investigations (34, 35).

The findings showed that continuous sport exercise leads to decrease of cholesterol and LDL-C. With regards to table 1 the results showed a significant increase in HDL-C in submaximal and maximal activity comparing with resting state in both groups ($p<0.05$) which correlates with the results from investigations of Paol, Domenan, Yevada, Havinger, and Rayakari (38, 39, 40, 43, 44, 45) . These finding also showed that even one session physical activity leads to a significant increase of HDL-C as an anti risk factor of coronary heart disease (55, 56). This result showed a significant increase in resting, submaximal and maximal activity in professional group comparing with nonprofessional group which also correlates with the results from reference 46, 47, 48. The result also showed that the difference in HDL-C level in professional group was considerable higher than nonprofessional group ($p<0.01$) which showed that maximal activity in professional athletes increase HDL-C, efficiently comparing with nonprofessional athletes which correlates with results from some investigations (48, 52).

Conclusion

Based on our investigation we can conclude that biomechanical movements after 15 minutes exercise and during exhaustion state lead to a considerable alteration in blood components. On the other hand short term and long term sport activities involve carbohydrate and lipid sources in energy cycle.

REFERENCES

1. Sandgol H., Sport physiology, first volume, national Olympic committee press, first print, 1993.
2. Noorbakhsh M, Relation between physical activity and some risk factors of coronary heart disease in male managers, harekat, 15,…..
3. Fax and maitoos, Sport physiology, 1999
4. Robert K. Moray, daryl K. graner, A. Maiz, Victor, Rodol, Biochemistry of Harper, 1996.
5. Rahmaninia F, Mohebbi H., Etemad Z, Effect of local exercise program on abdominal muscles on body fitness and serum lipids of male students, harekat, 19.
6. Michael E. Hoston, Biochemistry basis for sport sciences, Guilan university press, 1998.
7. D. Lenor , Role of sport in heart efficiency, astan qods razavi press, forth print, 1993.
8. Fox,E,L,Sports physiology,Philadelphia , saunders , Co.,1985.
9. Wahren, J.Glucose turnover during exercise in man , Ann .N.Y. , Acad.Sci., 301:45-55 , 1977
10. Takada ,H, et al. Eating habits, activity ,lipids and body mass index in japaness children , the shiratori children study . Int. J. obes.Ralat.melat. Disorder, 1998, 22(5),p:470-76
11. Zierler. K.L,et al. Muscle metabolism during exercise in man. Trans ass, AM .Physician ,1963, 81:PP:266-73
12. consensus development conference. lowering blood cholesterol to prevent heart disease.jama,253:2080-2086,1985
13. huttunen,JK,Lansimies,E,voutilainen,E,Enholm,c, and et al.effect of moderate physical exercise on serum high-density lipoproteins. Circulation,60(6):1220-9,1979
14. Bouchard,C,shepherd,RJ,stephens,T,Sutton,JF,Mcpherson,BD,and et al.Exercise fitness,and health. The consenus statement .in:Exercise , fitness and health . A consenus of current knowledge.champaign IL, USA:human kinetics,1990,3-28
15. Raz, I. Israeli, A, Rozenbilt, H, Baron, H .Influence of moderate exercise on glucose homeostasis and serum testosterone in young men with low HDL-choleserole levels.diabetes Res., 9:31-5 , 1988
16. Paffenbarger , RS,and Hyde, RT.exercise as protection against heart attack. N Engl . J . med , 302:1026-1027 , 1980

17. Lehtonen , Aviikari, J .Serum triglycerides and cholesterol and serum high density lipoprotein concentration and metabolism with prolonged exercise training . Circulation , 78:25-33 ,1988
18. Haskell , Wl , Exercise –induced changed in plasma lipids and lipoproteins . Prev. med . ,13:23-36 , 1984
19. Suter , E, Marti , B Tschopp, A, and et al. Effects of self-momitored jogging on physical fitness, blood pressure and serum lipids: a controlled study in sedentary middle-aged men . int.J. sports. Med., 11(6):425-32, 1990
20. Lipson , LC, bonow, Ro, Schaefer, EJ, Brewer,HB, Lindgren ,FT.Effect of exercise conditioning on plasma high density lipoproteins and other lipoproteins. Atherosclerosis, 37(4):529-38,1980
21. Juneau , M.Rogers , F.De santos, V.Yec, M,Evans, A.Bohan , A. Haskell , WL . and et al
22. Effectiveness of self-monitored, home-based , moderate-intensity excecise traning in middle-aged men and woman . Am . J. cardiol. ,60(1) : 66-70 , 1987
23. Rubinsten .A .R. "Lipoprotein profile changes During intense training of Israeli military recrution " . Med . Sci .Sports . Exercise . 1995 ,27(4) , PP :480-84.
24. Hubinger , - L ; Mackinon ,- L, -T ,"The effect of endurance training on Lipoprotein(a)
25. (Lp(a)) Levels in middle – aged males" .Med .Sci.Spt. exe;28(6),June 1996 ,757-764
26. Ettinger ,W. H and et al , High Density Lipoprotein cholesterol subfractions in older people . J . Gerontology Medical sciences , 1994.
27. Hartung , G . H . and et al , Realation of diet to high density Lipoprotein cholesterol in Middle-aged Marathon . runners . 1980.
28. Lehtonen , A.and et al ,Serum Triglycerid and cholesterol and serum High density
29. Lipoprotein cholestrerol in Highly physically active men , Acta . Med . scand ;1991.
30. Mccal , M. R. and Modification of LCAT activity and HDL structure Arterioscler thromb . 1994
31. Muray , R.K .and et al ,Biochemistray , 23th Edition , Appleton and Lange . 1993 .
32. Nillila , E.A and et al ,Lipoprotein Lipase activity in Adipose Tissue and skeletel muscle of Runners , 1989 .
33. Ren-Ming ,H.U . and et al ,high density Lipoprotein simulate the production and secretion of endothelin-1 from cultured Bovine Aortic Endothelial cells . 1994.
34. Williams ,P. T. Krauss , R. M .Wood , P. D . Lindgren ,F. T. Gitoras , C . and Vranizan , K.M. Lipoprotein subfraction of runners and sedentary men . metabolism, 35 :45-52, 1986 .
35. Macek ,. M, "A comparison of Coronary risk factors in groups of trained and untrained
36. Adolescents" , Eur . j .apple .physiol .accup .physiol .(Berlin,FRG); 58(6),Apr 1989, 577-582.
37. Kumagai , S , "The effect of endurance training on the relationships between sex hormone biding globulin , high density lipoprotein cholesterol ,apoprotein A1 and physical fitness in pre-menopausal woman with mild obesity " ,Int. J .Obes. Relat . Metab .Disovd . , Apr 1994 18(4) P 249-54.
38. Steinberg , D .,Parthasarathy, S .,Carew , T.E , & et al ,(1989) N.Engal .J.Med. 320,915-924.
39. Dawber , T.R. (1980) The Framingham study ,The Epidemiology of Atherosclerotic Disease ,Harvard University Press , Cambridge , MA .
40. salttery , ML ,Jacobs ,DR Jr – Physical fitness and cardiovascular disease mortality : the US Railroad study .Am J Epidemiol , 127: 571-80 ,1988 .
41. Oyelola , OO & et al ," Plusma lipid , Lipoprotein and apoprotein profile in Nigerion
42. University athletes and non-othletes " , Br . J .Sports .Med ., Dec 1993, Vo.27(4),P 271-4