

—
:
/ / :
/ / :

— — — —
) ((1RM (VO2max
cc
T
.P≤ /
) (P≤ /)
(P≤ /)

Email : h_arazi2003@yahoo.com

2 - Concurrent Exercises

3 - Leukocyte



.()

.()

.()

.()

.(,)

.()

.()

.()

. ,)

()

()

.(,)

)

()

.()

(

-
- 1- Cytokines
 - 2- Leukocytes Adhesion
 - 3- Field et al
 - 4- Nielsen et al

...	-
() VO ₂ max	() .()
.()	()
() .()	VO ₂ max
.()	VO ₂ max
() .()	.()
.	.()
)	.()
() .()	.()
VO ₂ max	/
.()	()
.()	VO ₂ max
.()	() ()

-
- 1- Ronsen et al
 - 2- Nieman et al
 - 3- Gleeson
 - 4- Ansley et al
 - 5- Simonson
 - 6- Tzai and Gleeson



, B T

(NK)

.()	.()	
()	()	.()
.(, , ,)		
()	()	.()
	.(, ,)	
.(,)		
.()	()	.()
	()	
.()	.(, ,)	()
	.(,)	
.()		

-
- 1- Innate Imunity
 - 2- Kendall et al
 - 3- Shek et al
 - 4- Gabriel et al
 - 5- Pedersen and Steensberg
 - 6- Scharhag et al
 - 7- Shinaki et al
 - 8- Iversen et al
 - 9- Nemet et al

...

-



()

.() ()

.(, ,)

.(, ,)

()

(1RM)(Kg)						VO ₂ max (ml/kg/min)	(Kg/M ²)	(%)	(Kg)	(Cm)	(Yr)	
/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	± /	#

()

/	/		/		
/ ± /	/ ± /	/ ± /	/ ± /	/ ± /	
*** 54/0.7 ± /	** 52/38 ± /	* 53/0.2 ± /			
*** 54/49 ± /	** 53/17 ± /			* 53/13 ± 0/68	

***, **, *



$$\begin{aligned}
 & \text{(VO2max)} \\
 & \text{(} \dots \text{) VO}_2\text{max} \\
 & \text{(} \dots \text{)} \\
 & \text{(} \dots \text{)} \\
 & \pm / \\
 & \text{VO}_2\text{max} \quad r = / \quad \text{VO}_2\text{max} \\
 & : \quad \text{(HR}_5\text{)} \\
 & \text{VO}_2\text{max (} \dots \text{ / (HR))}
 \end{aligned}$$

(IRM)

-
- 1- Fax
 - 2- Lat Pull-Down



(VO₂max)
)
(VO₂max
)
1RM
(
)
)
(
)
(

cc,

(/ / , , /)

(,)

K₃EDTA

(,)

(Sysmex K-1000) Cell Counter

(.)

(PV)

: b

a,

:RCV,

:BV,

$$BV_a = BV_b \times (HB_b / HB_a)$$

$$RCV_a = BV_a \times HCT_a$$

$$PV_a = BV_a - RCV$$

$$BV_b = \text{mI}$$

$$RCV_b = HCT_b$$

$$PV_b = [1 - (HCT_b / 100) \times 100]$$

t



SPSS/13

P< /

-

.()

.()

.() (P< /)

.()

.(,) (P< /)

)(P< /)

.(

.(P< /)

.()

.()

1- Bonferroni Post-hoc Test

_____) _____ (_____ ,

P									
/	/	/			(x), /μL)				
	/	/							
/	/	/					(x), /μL)		
	/	/							
/	/	/							(x), /μL)
	/	/							
/	/	/			(x), /μL)				
	/	/							
/	/	/					(x), /μL)		
	/	/							
/	/	/							(x), /μL)
	/	/							
/	/	/			(x), /μL)				
	/	/							
/	/	/					(x), /μL)		
	/	/							
/	/	/							(x), /μL)
	/	/							
/	/	/			(x), /μL)				
	/	/							
/	/	/					(x), /μL)		
	/	/							
/	/	/							(x), /μL)
	/	/							
/	/	/							
	/	/							

... -

,) (- ,

P			/		
/	/	/			(× 10 ⁶ /μ L)
	/	/			
/	/	/			
	/	/			
/	/	/			
	/	/			
/	/	/			
	/	/			

, () -

P	F			/	
/	/	/	/		(× 10 ⁶ /μ L)
/	/	/	/		
/	/	/	/		(× 10 ⁶ /μ L)
/	/	/	/		
/	/	/	/		(× 10 ⁶ /μ L)
/	/	/	/		
/	/	/	/		(× 10 ⁶ /μ L)
/	/	/	/		
/	/	/	/		(× 10 ⁶ /μ L)
/	/	/	/		

P ≤ / *

()

P					
/	/	/			(x) / (μL)
/	/	/			
/	/	/			
/	/	/			
/	/	/			(x) / (μL)
/	/	/			
/	/	/			
/	/	/			

P ≤ /

*

()

()

1- Upper Respiratory Tract Infection

HPA

,)

()

, ()

.(

.()

()

()

,)

.(

... -

, ,)
() ()
, , ,)
, () ()
,
, ,
, ,
, () ,
, ()
, ()(**VO₂max**))
,
, ,
VO₂max
, () ,
, ,
,)
, (

-
- 1- Lymphocytosis
 - 2- Weight Lifting
 - 3- Rowing



() () ()
() (, ,) ()
(,) ()

()
NK ()
() ()

() () ()
()
()

1. *Benschop, R.J., M. Rodriguez-Feuerhahn, and M. Schedlowski, (1996). "Catecholamine-induced leukocytosis: early observations, current research, and future directions". Brain Behav. Immun. 10 : PP:77-91.*

2. *Brenner, I.K., J.Zamechik, P.N. Shek, and R.J. Shephard, (1997). "The impact of heat exposure and repeated exercise on circulating stress hormones". Eur J. Appl. Physiol. 76 : PP: 444-454.*

3. *Dhabhar, F.S., A.H. Miller, M. Stein, B.S. McEwen, and R.L. Spencer. (1994). "Diurnal and acute stress-induced changes in distribution of peripheral blood leukocyte subpopulations". Brain Behav. Immun. 8 : PP:66-79.*

4. *Dill, D.B., and D.L. Costill. (1974). "Calculation of percentage changes in volume of blood, plasma, and red blood cells in dehydration". J. Appl. Physiol. 37: PP:274-248.*

1- Stress Hormones

2- Acute Phase Proteins

-
-
5. Ansley P.J, A. Blannin and M.Gleeson, (2007). "Elevated plasma interleukin-6 levels in trained male triathletes following an acute period of intense interval training". *E J Appl Physiol*, 99(4) : PP:353-360.
 6. Field CJ, R. Gougeon and E.B. Marliss, (1991). "Circulating mononuclear cell numbers and function during intense exercise and recovery", *J Appl Physiol*, 71 : PP: 1089-97.
 7. Gabriel. H, L. Brechtel, A. Urhausen , and W. Kindermann. (1994). "Recruitment and recirculation of leukocytes after an ultramarathon run", *Int J Sports Med*, 15 :PP: S148-S153.
 8. Gleeson. M. (2007). "Immune functions in sport and exercise". *J Apple Physiol*, 99(3) : PP:115-24.
 9. Gleeson.M.,(2006). "Immune system adaptation in elite athletes". *Curr opin clin nutr Metab Care*", 9(6) : PP:659-65.
 10. Halson S.L, G.L. Lancaster, A.E. Jeukendrup, and M.Gleeson , (2003). "Immunological responses to overreaching in cyclist". *Med Sci Sports Exerc*, 35 :PP:854-861.
 11. Iversen, P.O.B.L. Arresen and H.B.Benestab, (1994). "No mandatory role for the spleen in the exercise-induced leukocytosis in man". *Clin Sci*, 89:PP:505-10.
 12. Kendall.A, L.Haffman-Goetz, M.Houston, B.MacNeil, and Y . Arumugan.,(1990). "Exercise and blood Iymphocyte subsets response: Intensity, duration, and subject fitness level". *J Appl Physiol*, 69 : PP: 251-260.
 - 13.Kim.H. J.Y. H.Lee, and C.K.Kim, (2007). "Biomarkers of muscle and cartilage damage and inflammation during a 200Km". *Eur J Apple Physiol*, 99 : PP:443-47.
 14. Lee J.I, (2006). "Effects of walking exercise intensities of fatigue, Serum lipids and immune function among middle-aged women". *Public Health nurs*, 36(1): PP:94-102.
 - 15.Maccarthy , D.A., and M, M.Dale, (1998). "The leukocytosis of exercise : A review and model". *Sports Med*, 6 :PP:333-63.
 16. Mccarthy , D.A.,I.Mcdonald , M.Grant, (1992). "Students on the immediate and delayed leucocytosis elicited by brief (30-min) strenuous exercise". *Eur J Appl Physiol*. 64 :PP:513-17.

-
-
17. Meyer. T.H.W. Gabriel, M.Ratz, H.J. Muller and W.Kindermann, (2001). "Anaerobic exercise induces moderate acute phase response". *Med Sci Sports Exerc*, 33(4) :PP:549-55.
18. Nemet. D.P, J. Mills and D.M. Gooper, (2004). "Effect of intense wrestling exercise on leukocytes and adhesion molecules in adolescent boys". *Br Sports Med*. 38:PP:154-58.
19. Nielsen H.B, N. Secher and B.K. Pedersen, (1996). "Lymphocytes and Nk cell activity during repeated bouts of maximal exercise". *Am J Physiol Regulatory Integrative comp physiol*, 271 : R222-R27.
20. Nieman D.C,S. Simandle, D.A. Henson, B.J. Warren, J.M.Savis and et al. (1995). Lymphocyte proliferative response to 2.5 hours of running". *Int sports Med*, 16 :PP:404-408.
21. Nieman D.C, Dru A Henson, M.D. Astin and V.A. Brown, (2005). "Immune response to a 30-minute walk". *Med Sci Sports Exerc*, 37(1) : PP: 57-62.
22. Nieman D.C.D. A, Henson, G.Gojannovich, J.M.Davis, E.Murphy, E.P Mayer and et al. (2006). "Influence of carbohydrate on immune function following 2h cycling". *Res Sports Med*, 14(3) : PP:225-37.
23. Nieman D.C. (1997). "Immune response to heavy exertion". *J Appl Physiol*. 82 : PP:1385-94.
24. Paczek. B.C and J.Prezybylski, (2005). "The influence of physical exercise upon immunological system in humans", *pol arch Med Wewn*, 114(4) : PP:997-1002.
25. Pedersen B.K and A.Steensberg, (2002). "Exercise and hypoxia : effects on leukocytes and interleukin-6: shared mechanisms"? *Med Sci Sports Exerc*, 34(12) : PP:2004-12.
26. Pedersen B.K, A.D. Toft, (2000). "Effects of exercise on lymphocytes and cytokines". *Br J Sports Med*, 34 : PP: 246-51.
27. Pedersen. B.K and L. Hoffman-Goetz, (2000). "Exercise and immune system: Regulation, Integration and Adaptation", *Physiol Rev*, 80: PP:1055-81.
28. Risoy B.A, T. Raastad, J.Hallen, K.T.Lappergard, K.Baeverjora and et al. (2003). "Delayed leukocytosis after hard strength and endurance exercise:Aspects of regulatory mechanisms", *Bio Med Physiol*, 3: PP:14.
29. Ronsen, O, J.K. Krach. E. Haugh, R.Bahr, and B.K.Pedersen, (2002). "Recovery time affects immunoendocrine responses to a second

bout of endurance exercise". Am J Physiol cell Physiol, 283 : PP: C1612-C20.

30. Ronsen, O., B.K. Pedersen, T.R. Oritsland, R. Bahr, and J. Kjeldsen-kragh, (2001), *Leukocyte counts and lymphocyte responsiveness associated with repeated bouts of strenuous endurance exercise". J Appl Physiol. 91 :PP:425-34.*

31. Scharhag, J.T. Meyer, H.H.W. Gabriel, B. Schlick, O. Faude, W. Kindermann, (2005). *"Does prolonged cycling of moderate intensity affect immune cell function"? Br J Sports Med, 39:PP:171-77.*

32. Schinaki, S, S. Shore, P.N. Shek and R.J. Shephard, (1992). *"Acute exercise and immune function". Int J Sports Med, 13 :PP:452-61.*

33. Sheck, P.N, B.H. Sabiston, A. Buguet, and M.W, Radomski, (1995). *"Strenuous exercise and immunological changes: A multiple – time-point analysis of leukocyte subsets". Int J Sports Med, 16: PP :466-74.*

34. Simonson. S.R, (2001). *"Immune response to resistance exercise J stre and con res". 15(3) :PP:378-84.*

35. Smith, J.A, (1991). *"Exercise immunology and neutrophils". Int J Sports Med. 18 :PP:S46-55.*

36. Soricther, S.M. Martin, P. Julius, A. Schwirtz, and et al. (2006). *"Effects of unaccustomed and accustomed exercise on the immune response in runners". 38(10) :PP:1739-45.*

37. Tzai, L.L and M. Gleeson, (2004). *"The effect of single and repeated bouts of prolonged cycling on Leukocyte redistribution, neutrophil degranulation, IL-6, and plasma Stress hormone responses". 14: PP:501-16.*