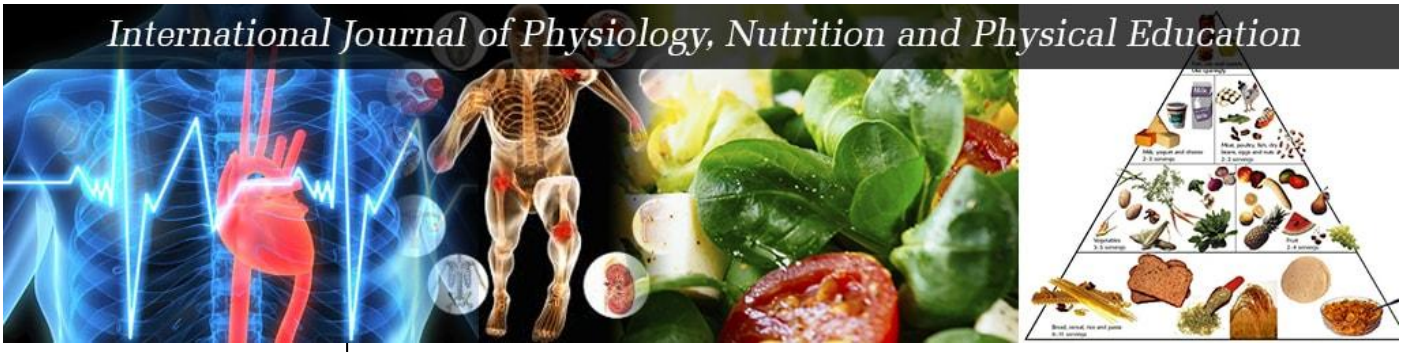

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Effect of varied tapering strategies on the Athletes mood state in selected athletics training centers of Ethiopia

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Abstract
The purpose of the present study was to investigate the effects of varied tapering strategies on the athletes' mood state which influence the performance of the athletes. Thirty seven young distance runners (mean age: 20 ± 1.97 years; mean training age: 2.43 ± .603 years) were randomly assign into High intensity-low volume (HILV) and high intensity-moderate volume (HIMV) taper groups. Training frequencies were five times per week and conducted for two weeks. Before and after two weeks of the taper intervention, the mood states were recorded using the profiles of mood states (POMS) questionnaires developed by Mac Nair *et al*, (1971). Total mood disturbances (TMD) had been calculated by adding all the negative mood states (aggression, tension, fatigue, confusion &depression) and subtracting the positive mood state (Vigor) for each participant athletes. The paired t-test and Post test ANCOVA showed that there was a statistical significant change in both within and between the HILV &HIMV taper groups. Though, there was no statistical significant difference in the mood subscales of tension, fatigue and depression between the two HILV &HIMV taper groups. In conclusion, the finding revealed that both the HILV &HIMV tapering strategies have important effects in the improvement of the TMD. Large effects in the reduction of TMD and improvements of the vigor were observed in the HILV taper group than the HIMV taper group.

Keywords: Tapering, high intensity-low volume, high intensity-moderate volume, physiological traits

Introduction
The usual hard training, competition and the wider knowledge of progressive overload training regimens severely influence contemporary training and recovery methods of the athletes (Neary *et al*., 1992) [2]. Now days, difficulties for athletes, coaches and researchers are finding strategies to increase performance in athletes. Most of the reports related to overtraining were mainly caused by insufficient recovery periods after the long exhaustive training (Zatsiorsky, 1950) [90]. All strategies done before a major competition were intended to boost performances by reducing the training loads and cumulated fatigue effects (Kentta & Hassmen, 1998; Matos & machado, 2010) [52, 61]. Due the above facts, exercise scientists were looking for different alternative training interventions, recovery methods, and dietary intake to increase the performance of an athlete (Mujika, 2009) [65]. This reduction of training load aiming to attain peak performance just before a competition is usually known as the taper (Bosquet *et al*., 2013) [13].

Tapering is defined as a short period reduction in the athletes' training load during few days/weeks prior to a major competition (Brannstrom, Rova, Ji-Guo, 2013; Shepley *et al*. 1992) [17, 79]. It is a strategy recommended by different exercise physiologists, researchers, training expertise and scholars applied before an important contest (Bompa & Haff, 2009) [11]. Tapering is important when the general and specific preparation period stayed more than fifteen weeks (Shepley *et al*., 1992) [79]. If no tapering, overtraining may occur in a competitive athlete (Morgan, 1987) [63]. Poor tapering characterized by reduction in training intensity or long period reduction in training volume (for more than 28 days) period resulted in detraining (Houmard, *et al*., 1994). If tapering was practiced improperly athletes might missing their peaking periods, thus compromising optimal performance.

The decrease in training load can be accomplished by reducing the number of practices sessions (frequency), the challenges of the work outs (intensity), the distances covered or the

time stayed in training at or during a specific session (volume) (Bosquet *et al*., 2013) [13]. However; the reduction of training load is done mainly at the expense of training volume, but not with training intensity (Hausswirth, & Mujika, 2013; Mujika *et al*., 2012) [66, 67], for a variable segment of time that depends on individual profiles of fatigue level and adaptation (Neary *et al*., 1992) [2]. Volume could be greatly reduced but training intensity remains high for trained athletes (Shepley *et al*., 1992) [79].

The reduction of training volume enables to have enough recovery time which aids in super compensations (Calder, 2002) and a brief high intensive training program also gives sufficient stimuli to prevent detraining (Bosquet, 2013, Houmard, 1998, Mujika, 2000, Neary *et al*., 1992 and Shepley *et al*., 1992) [2, 68, 79].

Well-designed taper program could enhance athletics performance by assisting the physiological and psychological recoveries which assists the adaptations process (Pyne, 2004) [75]. The recovery status of the athlete that could be recognized by observing the specific physiological and psychological components was considered as vital factors (Barrett, 2001; Halson, 2014; Ishak *et al*., 2016) [38, 50]. Athletic performance is mostly considered as products of a synergistic interaction of the physical, physiological, emotional, mental, and social factors that interact with an external environment (Long, 2012; Venter, 2008) [59, 84]. Such interactions have a profound effect on the athlete's mood state of the athlete, which ultimately affects the sport performance (Benjamin and Lamp, 1996) [8]. A change in mental set up can affect the athletes' wholesome and their capacity too (Noakes, 1991) [74].

In contemporary periods, the society were facing different challenges (National Academy of Sciences, 1997; Zografova, 2016) [19, 89] coming from social media, economic crisis, political instability, ever changing and unlimited public interest etc. Athletes have all those factors since they are parts of this universe and have many additional stresses as like the need for professional prestige, sponsorship, training related stress and other (Wong *et al*., 2006) [86]. Due to this, many scholars, athletes and coaches are worrying on the mechanisms on how to balance the demands of progress over loading or training stress and athlete's recovery (Halson, 2014; Kentta, Hassmen, 1998; Lattier *et al*., 2004) [39, 57]. Most theoretical assumption forwarded concerning on this challenges were advise that the greater the training load or the level of stress the more time require for recovery (Bompa, 1999; Coutts, 2001; Kallus & Kellmann, 2000; Kellmann, 2002; Peterson, 2003) [10, 22].

The strategies used to deal the training load and other related stress could play a key role in the likelihood to achieve high performance level (Gulbin *et al*., 2013) [35]. Therefore, it is important to measure the possible changes attain after any interventions made for aiming refreshing the stressed, fatigued or over trained athletes. The Profile of mood states (POMS) questionnaires are commonly used tools that provide valuable information about the recovery statuses of the athletes (Grove and Prapavessis, 1992; McNair *et al*., 1971 [62]. The POMS questionnaires have been widely used in sports setting and effectively measure the level of stress (Hadala *et al*., 2010). In addition, they are also viable psychological tool for monitoring athletes' mood states during periods of intensified training (Kentta *et al*., 2006; Morgan *et al*., 1987) [54, 63].

According to Weinberg and Gould, (2015) [85], "mood is commonly defined as a transient state of emotional or affective arousal of varying intensity and duration". Cox, (2012) also define mood as a situation specific, somewhat a temporal psychological response to an environmental stimulus. Research findings on the effect of mood states on athletes' performances have significant imputes in the knowledge and practice of sport psychology (Lane *et al*., 2007) [55]. Many athletes have good performances in practice sessions; but they couldn't transfer their preparation period capabilities and abilities to the competitive forum (Esfahani *et al*., 2011). This was probably because of the emotional disturbances and problems related to the mental setup which could influence the attention and concentration (Long, 2012; Venter, 2008) [59, 84]. An increasing in the negative mood states resulted from the reduction of motivation, concentration and other sport related mental skill (Lane *et al*.,2005), result a reduction in the athletes performance (Beedie *et al*., 2008) [7]. Mood measures were most successful in predicting performance in sports that are short in duration (LeUnes, 2000), involve in individual sports rather than team sports, and most applicable in sports groups with homogenous abilities, (Lane *et al*., 2005) [56].

Many research findings revealed that tapering improves the mood state which can help to predict the performance outcome (Brandt *et al* 2016; Haythornthwaite & Edwards, 1995; Guest, 2014; Lane *et al*., 2005; Lane & Terry, 1999; Taylor, 2015) [16, 45, 56]. Scientifically planned taper program expected to improve the performance from 0.5-6% (Mujika, 2000) [68]. Though; care should be taken while reducing the training loads and taper practice (Grivas, 2018; Hovanloo *et al*., 2012) [32, 49] and it has to be designed very systematically (Spilsbury, 2016; Spilsbury *et al*., 2014) [80, 81]. This might be because of that, no commonly agreed tapering (load reduction) formula. Some report as a reduction of 60-70% of the training volume is considered to be appropriate to improve endurance performance without causing detraining symptoms (Houmard *et al*., 1989), while others suggest a minimum of 70% of the training load is needed to maintain training induced VO2 max (Hickson *et al*., 1985) [46]. Banister (1999) [22], also reported that, there was a recorded performance improvement after 31% of reduction of training volume.

The unconformities in the various research findings, opinions and practices that we observe, hear and see about tapering create uncertainty and confusion with coaches &Athletes. Due to above facts Coaches, athletes and sport experts face difficulties to decided which procedure is the best fit for them and they fear the risk of detraining in case of errors they made (Mujika, 2000) [68]. As a result, coaches and athletes develop hesitation to implement it fully according to the taper principles. Baker and Cobley, (2008) [1] also identify the issue related to lack of coaches and athletes confidence as it was the most feared strategies of peaking performance. Most arguments were on about; the amount of training load to be reduce and the way of reduction (step wise or a progressive) which could influence the effectiveness of the taper (Banister, 1999) [22].

Based on the researcher's experience (practical observation and discussion with persons athletes, coaches and professionals) on the concepts and value of tapering; almost all didn't have well organized and proof understandings of its importance & application. Due to this, they gave less attention for its implementation. Off course it is wise decisions not fully accept/reject a research finding done outside of the situations they live and have. It may not effective in Ethiopian situations. This study intends to investigate and compare the effects of varied tapering strategies on the mood states of endurance athletes in selected athletics training centers (ATC) of Ethiopia.

Methodology

Location/areas of the Study

The centers of attention were two athletics training centers (Maychew and Tenta) found in Tigray and Amhara regional states of Ethiopia at an altitude of 2860 and 2679 m meters above sea level and 625 and 520km far from Addis Ababa, the capital city of Ethiopia respectively.

Sample and sampling techniques

37 competitive endurance athletes from the two athletics training centers (ATC) were volunteered to participate in this study. Total population (Census sampling) could be used because they are few in numbers and all are taken as a sample. Athletes who are going to be competitive, have minimum training experience of two years, engage in training regularly for the last 3 months, free from illness or injury conditions, weekly training load comprises 25km -50km could be included and those who are not were excluded.

Design of the study

A quasi-experimental design was used (Muijs, 2004) with parallel group setting (Ofori-Asenso & Agyeman, 2015). Participant athletes were assigned to the high intensity-low volume (HILV) and high intensity-moderate volume (HIMV) taper intervention groups using block randomization techniques. Pre-post test data collection methods were used.

Data collection procedures

The Profile of Mood States (POMS) questionnaires (McNair *et al*., 1971) [62] which contain the 65 self-report items using the 5-point Likert Scale were mainly used to collect the psychological data. The questionnaires contain a series of descriptive words/statements that describe feelings of people have (Wood, 2017) [31]. Scoring for each item is recorded as zero (0) for 'Not at all' up to four (4) for 'extremely'. A Total Mood Disturbance (TMD) score is calculated by summing the totals for the negative subscales (tension, depression, fatigue, confusion, anger) and then subtracting for the positive subscales (vigor) (McNair *et al*., 1971; Wood, 2017) [62, 31].

Data Analysis

Initially, the data were tested for assumptions of normality using the Shapiro-Wilk and kolomogrove test and it confirms normal distribution. Demographic characteristics of the participant athletes were assessed and analyzed using descriptive statistics. Independent t-test (comparing the baseline differences between groups), paired-test (changes in the pre &post test scores) and ANCOVA (differences between groups in post test scores) were used. Results were reported by using M±SD and MD. The level of significance was set at α=0.05, $P < .05$. SPSS V. 20 were used for all analysis.

Ethical consideration

Ethical approval was assured from Ethical committee of Mekelle University with reference no.ERC0772/2016. Participant Consent was guaranteed. Information confidentiality and individual's right were boldly stated.

Results

Table 1: Base line test differences between groups

			Pre			
	Groups	**Variables**	**M±SD**	**t**	**df**	**p**
Pret TMD	HILV	TMD	95.60 ± 6.58	-1.258	1,37	.216
	HIMV	TMD	98.32± 6.90			

Where, TMD= Total mood disturbance, HILV = high intensity low volume taper groups, HIMV=High intensity moderate taper group, M =mean, SD= standard deviations, difference is significant at p<0.05

There was no observed significant differences (p > .05) between the two groups (as seen in table1) in their baseline scores prior to the taper intervention at α = 0.05 level. Possible changes occurred after the taper might be because the taper program.

Table 2: Paired (pre &post) differences between intervention groups

		Pre	Post				
Groups	**Variables**	**M±SD**	**M±SD**	**MD**	**T**	**df**	**P**
HLt	TMD	95.60 ± 6.58	60.40 ± 6.29	-35.20	-14.51	19	0.000
HMt	TMD	98.32 ± 6.89	75.24 ± 8.50	-23.47	-9.093	16	0.000

Where, TMD= Total mood disturbance, HILV = high intensity low volume taper groups, HIMV=High intensity moderate taper group, M =mean, SD= standard deviations, MD = mean differences, difference is significant at p<0.05

According to the paired t-tests analysis (table-2), significant differences were seen (p < .05) within each taper group. This means, both strategies the HILV and HIMV taper strategies had significant effects on the athletes mood states which was measured using the TMD total mood disturbances (TMD) with MD = -35.20, at t (19) = -14.51, p < .001 for the HILV taper group and MD = -23.47, at t(16) = -9.093, p < .001 for the HIMV taper group, at α = .05 level.

Table 3: Differences between groups in post-test RBC (ANCOVA)

Variables	**Group**	**N**	**M**	**SD**	**df**	**F**	**P**	**Partial η^2**
TMD	HILVt	20	60.40	6.29	1,35	43.26	.000	.591
	HIMVt	17	75.24	8.50				

Where, TMD= Total mood disturbance, HILV = high intensity low volume taper groups, HIMV=High intensity moderate taper group, M =mean, SD= standard deviations, difference is significant at p<0.05.

Post test score differences between groups were also checked using ANCOVA (as seen in table 3) which could help to covariate (control) variations in the post test values due to the differences in training periods, age& sex among participants.

There was a statistical significant differences ($p < .05$) between the groups at $\alpha = 0.05$ level.

Discussions

The purpose of this study was to examining the effects of varied tapering strategies on the psychological traits measured using the profiles of mood states questionnaires (POMS) that have decisive role on the performance of an individual athlete during a major competition (Beedie *et al*., 2008) [7]. It was initially hypothesized that, the high intensity-low volume (HILV) and the high intensity moderate volume (HIMV) taper might have significant effects on the psychological traits of endurance athletes and the high intensity-low volume taper might be more effective than the high intensity-moderate volume taper. The result showed that, there were significant changes ($p < .05$) within both (HILV &HIMV) taper groups (table 2). When comparing the results between the groups there was a significant difference ($p < .05$) between the HILV and HIMV taper with $M = 60.40 \pm 6.29$ for the HILV and $M = 75.24 \pm 8.50$ for the HIMV taper groups at $F (1, 35) = 28.52$, $P < .001$ and partial $\eta^2 = .487$ (48.7%). In consistent with the set hypothesis, evidence found that, the HILV taper strategy might be more effective than the high intensity moderate volume taper in improving mood states since the mean mood disturbance of the HILV ($M = 60.4$) taper group was lower than the HIMV ($M = 75.24$) taper group.

When we see the changes in the subscales, the results of this study showed that, there was significant difference on the aggression-Hostility, Confusion-Bewildments and Vigor-Activity but insignificant in the Tension-Anxiety, Depression-Dejection and Fatigue- Inertia related mood scale. Higher feeling of vigor and lower aggression and confusion were observed in the high intensity low volume taper groups than the high intensity moderate volume taper groups. This may happen as a result of the differences in the amounts of volume they engaged during the two weeks taper periods. Since athletes were practiced with the same training intensity during the two weeks taper period but different in the training volumes. The HIMV taper group is being stressed more as a result of the relatively high amount of volume they engage than the HILV taper groups. This analogue was consistent with the research finding done by Houmard *et al*., (1994) [47]; Mujika *et al*., (2000) [68], stating as "activities performed during the pre-competition (taper) phases is specially emphasize on short bouts of exercises" which is important to practice unusual speed fluctuations during the actual race (Bishop, Edge, 2005) [9] and provide more rest to refresh the accumulated fatigue effects during the high training load (Halson, 2014) [38]. Short bouts of intensive exercise had better values in lessening the TMD of the endurance athletes than performing it for relatively longer durations (Boyadjiev & Taralov, 2000) [15]. This study was coherent with a study done by Hansen *et al*., (2001) on the effects of exercise duration on mood states which revealed that keeping the intensity at a moderate level (60% of the maximum heart rate) could improve levels of vigor with reduced level of confusion, fatigue and total negative moods. Their finding revealed that improvements in vigor, fatigue, and total mood disturbance occurred after 10 min of exercise, with progressive improvements in confusion over 20 min but no additional improvement over longer time involvements or training durations.

Previous research has been focused on the possible changes in mood state after the different tapering programs. Most of the studies have assessed mood states subsequent to an acute bout of or chronic exposures to training (Beedie, *et al*., 2008) [7]. Both acute and chronic exercise programs resulted in improves affective states including lower levels of depression &dejection (Bartholomew, 2005). Supportive research finding from (Bartlett *et al*., 2011; Ekkekakis *et al*., 2011) [6] showed that, higher intensive exercise particularly above 85% of max HR has been reported to increase measures of tension, fatigue and unpleasant psychological responses during and immediately after exercise. Though; such negative mood states would return to lower levels even below the previous best records of mood level during the recovery period just after 10–90 min. Similarly, also provide an evidence that the individual's mood state, energy and enjoyment were improved just after the completions of a given high intensive exercises. However; longer duration of training continuous for more than 30 min would result in greater feelings of fatigue, tension or un pleasant psychological responses and the effects may persist for longer periods of time as compared with the short bouts of intensive training (Wood *et al*., 2017) [31]. Tharion *et al*., (1999), carry out a similar research on resistance exercises stating as "the effects of high repetition and set and low repetition and sets of resistance exercises on the mood states", in which training load is describe using the weight (intensity) and repetitions and sets (volume) and revealed that, a higher negative moods (tension, depression, fatigue) with lower vigor were observed in the high repetition and sets groups than the few repetitions and sets. In general, higher intensity longer duration (volume) of training would cause more disturbances in the mood states than the high intensity short duration training patterns. The effects of the former also stayed relatively for longer as compared with the high intensive and -short duration (low volume) training schedule.

Conclusion

Tapering has beneficial effects for the improvement of mood regardless of the amount of volume reduced. Significant changes were observed following the high intensity-low volume (HILV) and high intensity-moderate volume (HIMV) taper interventions. In addition, high intensity low volume taper groups exhibit more positive mood profile (vigor) and less negative mood profiles (tension, aggression, depression, fatigue and confusion) than the high intensity-moderate volume taper groups. High score in the values related to vigor-activity and low values in the remaining five categories are desirable for good athletic performance and express as a stage of peak performance.

References

1. Baker J, Cobley S. The role of training in developing the expert athlete, Published, 2008.
2. BANISTER EW, CARTER JB, ZARKADAS PC. Training theory and taper: validation in triathlon athletes. Eur. J Appl. Physiol. 1999; 79:182-191.
3. Barnett A. Using Recovery Modalities between Training Sessions in Elite Athletes, 2006.
4. Does it help? Journal of sports med. Institute of human performance, the university of Hong Kong, Flora Ho sports center, 111-113 pokfulam Road, Hong Kong.; review article, 2006; 9:781-796.
5. Bartholomew JB, Morrison D, Ciccolo JT. Effects of Acute Exercise on Mood and Well-Being in Patients with Major Depressive Disorder. Medcine 7science in sport &exercise; the University of Texas at Austin, Departments of Kinsiology and health education, 2005.

DOI: 10.1249/01.mss.0000178101.78322.dd; ISBN: 0000178101
6. Bartlett DB. Impact of Physical Activity on Immune Function and Inflammation in the Elderly. Doctoral dissertation, School of Immunity and infection, college of medical and dental science, university of Birmingham; unpublished sources, 2014.
7. Beedie CJ, Terry PC, Lane AM. The profiles of Mood state and Athletics Performance. Two meta –analysis. Journal of Applied Sport Psychology. 2008; 12(1):49-68. Http:// dx.doi.org/10.1080/104132000008404213
8. Benjamin D, Stray-gundersen J. Living high-training low: effect of moderate-altitude acclimatization with low-altitude training on. University of Birmingham; unpublished sources, 1997.
9. Bishop PA, Jones E, Woods AK. Recovery from training: A brief review: Brief review. The Journal of Strength & Conditioning Research. 2008; 22(3):1015-1024.
10. Bompa T. Theory and Methodology of Training: The Key to Athletic Performance. Dubuque: Kendall/Hunt Publishing Company, 1999.
11. Bompa TO, Haff GG. Periodization Theory and Methodology of Training Human Kinetics, 2009. Web site: www.HumanKinetics.com
12. Bompa, Tudor O. Periodization Training for Sports, Human Kinetics, 1999. ISBN: 0-88011-840-7
13. Bosquet L, Berryman N, Dupuy O, Mekary S, Arvisais D, Bherer L, Mujika I. Effect of training cessation on muscular performance: A meta-analysis, research review, Blackwell Publishing Ltd, 2013.
14. Bosquet L, Montpetit J, Arvisais D, Mujika I. Effects of Tapering on Performance: A Meta-Analysis. Med. Sci. Sports Exerc. 2007; 39(8):1358.
15. Boyadjiev N, Taralov Z. Red blood cell variables in highly trained pubescent athletes: a comparative analysis. BMJ, 2000. co; http:??bjsm.bmj.com
16. Brandt R, Herrero D, Massetti T, Crocetta TB. The Brunel Mood Scale Rating in Mental Health for Physically Active and Apparently Healthy Populations. Scientific research Publishing, 2016. Http:?www.scirp.org/jourrnaal/health.
17. Brannstrom A, Rova A, Yu JG. Effects and Mechanisms of Tapering in Maximizing Muscular Power. Horizon Research Publishing, Sport and Art. 2013; 1(1):18-23. DOI: 10.13189/saj.2013.010103, http://www.hrpub.org
18. Calder A. Recovery strategies for sport Performance. Workbook. Applied sport knowledge Pty Ltd. Australian Institute of Sport, 2005.
19. Challenges facing the changing society. National Academy Of Sciences; National Academy of Engineering; Institute Of Medicine National Research Council, 1997.
20. Cohen J. A power primer. Psychological bulletin, 1992; 112(1):155-159.
21. Cox LA. Confronting Deep Uncertainties in Risk Analysis. Risk analysisi international Journal. 2012; 32(10) https://doi.org/10.1111/j.1539-6924.2012.01792.x
22. Coutts AJ, Reaburn P, Piva TJ, Murphy. Changes in selected biochemical, Muscular strength, power, and endurance measures during deliberate overreaching and tapering in rugby league player. Inte J sport Med. 2007; 28:116-124.
23. Burke L, Cox G. The complet guidd to ffod for sport performance (third edition). Peak nutrition for your sport. Allen &UNWIN; Alexander street, Australia, 2010.
24. Daniel Muijs D. Doing Quantitative Research in Education with SPSS, Sage Publications, London Thousand Oaks New Delhi, 2004.
25. Ekkekakis Hall EE, Petruzzello SJ. The Relationship Between Exercise Intensity and Affective Responses Demystified. Annals of Behavioral Medicine. 2008; 35(2-1):136-149, https://doi.org/10.1007/s12160-008-9025-z
26. Ekkekakis P. Affective–Reflective Theory of physical inactivity and exercise: Foundations and preliminary evidence. Ger J Exerc Sport. Cross Mark. 2018; 48:48-58. https://doi.org/10.1007/s12662-017-0477-9
27. Esfahani A, Wong JMW, Mirrahimi A, Villa CR, Kendall CWC. The application of the glycemic index and glycemic load in weight loss: A review of the clinical evidence. Critical Review. University of Toronto, Toronto, Canada. JBMB Life. 2011; 63(1):7-13.
28. Farhangimaleki N, Zehsaz F, Tiidus PM. The effect of tapering period on plasma pro-inflammatory cytokine levels and performance in elite male cyclists. Journal of sport science and medicine. Wilfrid Laurien University, Waterloo ON, Canada. 2009; 8:600-606: http://www.jssm.org
29. Fernandes T, Soci UP, Melo SF, Alves CR, Oliveira EM. Signaling Pathways that Mediate Skeletal Muscle Hypertrophy: Effects of Exercise Training. INTECH; Chapter Nine, 2012. http://dx.doi.org/10.5772/51087
30. Woods AL, Garvican-lewis LA, Lundy B, Rice AJ, Thompson KG. New approaches to determine fatigue in elite athletes during intensified training: Resting metabolic rate and pacing profile, 2017. PLOS; DOI: 10.1371/journal.pone.0173807; ISBN: 1111111111; http://dx.doi.org/10.1371/journal.pone.0173807
31. Grivas GV. The Effects of Tapering on Performance in Elite Endurance Runners: A Systematic Review. Department's f physical education and sport science, University of Thessaly, Trikala, Greece. International journals of sport science. 2018; 8(1):8-13; DOI:10.5923/j.sports.20180801.02)
32. Grove R, Prepavessis H. Abbreviated POMS Questionnaire (items and scoring key), 2016. https://www.researchgate.net/publication/299823508_Abbreviated_POMS_Questionnaire_items_and_scoring_key
33. Guest RJ. The Effects of Massage on Mood State, Range of Motion, Sports Performance, and Perceived Performance. Thesis dissertation professional paper. The university of Nontana. Unpublishe paper, 2010.
34. Gulbin JP, Croser MJ, Morley EJ, Weissensteiner JR. An integrated framework for the optimization of sport and athlete development: a practitioner approach. J Sports Sci. 2013; 31:1319-1331. https://doi.org/10.1080/02640414.2013.781661
35. Hadala M, Cebolla A, Banos R. Profile and its Influence on Injury Pattern in America's Cup Racing Crew, 2012. J sport. Med doping. DIO:10.4172/2161-0673,S5-001
36. Hall CJ, Lane AM. Effects of rapid weight loss on mood and performance among amateur boxers. Unpublished paper, 2001.
37. Halson SL. Monitoring Fatigue and Recovery. Recovery Center. Australian institute of sport, Canberra. Australia. Journals of sport science exchange, 2014.
38. Halson SL. Monitoring training load to understand fatigue in athletes. Sports Medicine. 2014; 44(2):139-147.
39. Halson SL, Jeukendrup AE. Does overtraining exist?

Sports Medicine. 2004; 34(14):967-981.
40. Halson SL, Bridge MW, Meeusen R, Busschaert B, Gleeson M, Jones DA *et al*. Time course of performance changes and fatigue markers during intensified training in trained cyclists. Journal of Applied Physiology. 2002; 93(3):947-956.
41. Halson SL, Lancaster GI, Jeukendrup AE, Gleeson M. Immunological responses to overreaching in cyclists. Medicine and Science in Sports & Exercise. 2003; 35(5):854-861. 27.No.135,1-6
42. Hansen AK, Fischer CP, Plomgaard P, Andersen JL, Saltin B, Pedersen BK. Skeletal muscle adaptation: training twice every second day vs. training once daily. Journal of Applied Physiology. 2005; 98(1):93-99.
43. Hausswirth C, Mujika I. Reconvert for performance in sport.institit of National du spor, university of Basque Country, Human Kinetics, 2013. ISBN:13.978-1-4504-3434-8
44. Haythornthwaite JA, Edward RR. Profile of Mood States (POMS). Departments of psychiatric & Behavioral Science. Johns Hopkins University. Baltimore, Maryland USA, 1995.
45. Hickson RC. Interference of strength development by simultaneously training for strength and endurance. Eur. J Appl Physiol. 1985; 45:255-269.
46. Houmard JA, Scott BK, Justice CL, Chenier TC. The effects of taper on performance in distance runners, Medicine and science in sport and exercise, 1994.
47. Houmard JA, Johns A. Effects of taper on swim performance. Practical implications. Sports Medicine, 1994; 17:224-232.
48. Hovanloo F, Ebrahim K, Alizadeh R, Davodi A. The Effects of Two Tapering Methods on Physical and Physiological Factors in Amateur Soccer Players. World Journal of sport science. 2012; 6(2):194-199. IDOSI Publication; DOI: 10.5829/idosi.wjss.2012.6.2.1126; ISSN: 2078-4724.
49. Ishak A, Idris S. Optimizing Physiological and Performance Outcomes Using Recovery Strategies Among Junior Atletes, 2016.
50. Kellmann M. The Recovery-Stress Questionnaires: User Manual. Enhancing recovery; preventing under performance in Athletes; The University of Queensland, Australia, 2016. DOI: 10.1109/LPT.2009.2020494; ISBN: 0385-2342, ISSN: 1041-1135
51. Kentta G, Hassman P. Overtraining and recovery: a conceptual model. Departments of sport psychology. Stockholm University; Stockholm, Sweden. Sport medic; Aidis international limited, 1998. DIO: 0112-1642/98/0007-0001/008.00/0
52. Kentta G, Hassmen P, Raglin JS. Mood state monitoring of training and recovery in elite kayakers. Eur J Sport Sci. 2000; 6:245-253.
53. Kentta G, Hassman P, Ragln JS. Training practices and overtraining syndrome in Swedish age group athletes, international journal of sport medicine. 2001; 22:1-6.
54. Kentta G, Hassman P. Under recovery and over training; A conceptual model, 2002. DOI:10.2165/00007256-1998; 26010-00001
55. Lane AM, Whyte GP, Shave R, Barney S, Wilson M. Mood disturbance during cycling performance at extreme conditions. Journal of sport science and Medicine; University of Wolverhapton, Gorway Road, Walsall, 2005. Http://www.jssm.orga
56. Lattier G, Millet GY, Martin A, Martin V. Fatigue and recovery after high-intensity exercise. Part II: Recovery interventions. International Journal of Sports Medicine; Physiology & Biochemistry, 2004. DOI: 10.1055/s-2004-820946; ISBN: 0172-4622; ISSN:01724622; PMID: 15459831.
57. LeUnes A, Burger J. Profile of Mood States Research in Sport and Exercise Psychology: Past, Present, and Future. Journal of Applied Sport Psychology; Taylor & Francis Publisher. 2000; 12(1).
58. Long JE. Psychological Factors, Physical Activity Status and Antibody response to Vaccination in healty and HIV positive populations. Doctoral dissertation, School odf sport and exercise science, College of life and Enviromental science, The University of Bimingham, 2012.
59. Long Y, Widegren U, Zierath JR. Exercise-induced mitogen-activated protein kinase signalling in skeletal muscle. Proceedigs of the Nutrion Society. 2004; 63:227-232. DOI: 10.1079/PNS2004346
60. Matos NF, Machado de. Overtraining and Burnout in Young English Athletes; Goreg thieme Velag KG, Riidigerstradle 14/70469, Stutgart, 2010.
61. Mcnair D, Lorr M, Droppleman L. Profile of Mood States; Manual. San Diego, CA: Educational and Industrial Testing Services, 1971.
62. Morgan WP, Brown DR, Raglin JS, O´Connor PJ, Ellickson KA. Psychological monitoring of overtraining and staleness. Br J Sports; Med. 1987; 21:107-114.
63. Morrison J, Larsen B, Cox AJ, Minahan C. The Post-Exercise Inflammatory Response to Repeated-Sprint Running in Hypoxia. Unpublished paper, 2018.
64. Mujika I. Tapering and peaking for optimal performance, Universities of Basque country united states of America, Human kinetics, 2009. IL-61825-5076 800-747-4457
65. Mujika I. Intense training: the key to optimal performance before and during the taper, Scandinavian journal of medicine &science in sport, John Wiley & Sons, 2010.
66. Mujika I, Goya I, Padilla S, Grijalba A, Gorostiaga E, Ibanez J. Physiological responses to a 6-d taper in middledistance runners: influence of training intensity and volume. Med. Sci. Sports Exerc. 2000; 32:511-517.
67. Mujika I, Goya I, Ruiz E, Grijalba A, Santisteban J, Padilla S. Physiological and performance responses to a 6-day taper in middle-distance runners: influence of training frequency. Int. J Sports Med. 2002; 23:367-373.
68. Mujika I, Padilla S. Detraining: loss of training-induced physiological and performance adaptations. Part I: short term insufficient training stimulus. Sports Med. 2000; 30:79-87.
69. Mujika I, Padilla S. Detraining: loss of training-induced physiological and performance adaptations. Part II: long term insufficient training stimulus. Sports Med. 2000; 30:145-154.
70. Mujika I, Padilla S. Scientific bases for precompetition tapering strategies. Med. Sci. Sports Exerc. 2003; 35:1182-1187.
71. Neary JP, Martin TP, Quinney HA. Effects of taper on endurance cycling capacity and single muscle fiber properties. Medicine & Science in Sports & Exercise. 1992; 35:1875-1881. doi:10.1249/01.MSS.0000093617.28237.20
72. Neary JP, Martin TP, Reid DC, Burnham R, Quinney HA. The effects of a reduced exercise duration taper programme on performance and muscle enzymes of

endurance. cyclists. Eur. J Appl. Physiol. Occup. Physiol. 2005; 65:30-36.
73. Noakes TD. Physiological models to understand exercise fatigue and the adaptations that predict or enhance athletic performance. Scandinavian Journal of Science and Medicine in Sports. 2000; 10:123-145
74. Pyne DB, Mujika I, Reilly T. Peaking for optimal performance: Research limitations and future directions. Journal of Sports Sciences. 2009; 27:195-202. doi:10.1080/02640410802509136; Dasilva and Alexander
75. Ofori-Asenso R, Agyeman G. Understanding Cross Over and Parallel group studies in Drug Research, Monash University (Australia), 2015. DOI: 10.14800/pm.1046. https://www.researchgate.net/publication/299873035
76. Schinke RJ, Peerson C. Enhancing the Hopes and Performance of Elite Athletes through Optimism Skills. Journal of excellence, 2007. http://www.zoneof excellence.com
77. Seiler D, Nagel D, Franz H, Hellstern P, Leitzmann C, Jung K. Effects of long distance running on iron metabolism and hematological parameters. Int J Sports Med. 1989; 10:357-362.
78. Shepley B, MacDougall JD, Cipriano N, Sutton JR, Tarnopolsky MA, Coates G. Physiological effects of tapering in highly trained athletes. Journal of Applied Physiology. 1992; 72:706-711.
79. Spilsbury KL. Tapering Strategies for Elite Endurance Running Performance. Doctoral dissertations; School of Sport and Exercise Sciences Loughborough University Loughborough Leicestershire LE113TU, 2016. :HTTPS:/dspace.Iboro.ac.uk/2134/23316
80. Spilsbury KL, Fudge BW, Ingham SA, Faulkner SH, Nimmo MA. Tapering strategies in elite British endurance runners. European Journal of Sport Science. Cross Mark, 2015.
DOI: 10.1080/17461391.2014.955128.
81. Taylor A. Physiological response to a short period of exercise training in patients with chronic heart failure. Physiotherapy research international whur publisher Ltd. London, 1999, 4(4).
82. Terry PC, Lane AM, Lane HN, Keohane L. Development and validation of a mood measure for adolescents. Journal of sport science. 1999; 17:861-872. B runel University, Osterley Campus, B orough Road, Isleworth, M iddlesex TW 7 5DU, UK
83. Venter RE. A model for psychophysiological regeneration of elite team athletes. Doctoral dissertation. Stellenbosch University, 2008.
84. Weinberg RS, Gould D. Foundations of Sport and Exercise Psychology (5th Ed.). Scientific Research an academic publisher. Champaign. IL: Human Kinetics, 2014.
85. Wong RS, Thung JS, Pieter W. Mood and Performance in Young Malaysian Karateka. Journal of Sports Science and Medicine. National Sports Institute of Malaysia and 2 Science University of Malaysia, Malaysia. CSSI. 2006, 54-59. http://www.jssm.org
86. Wood Robert. Profile of Mood States (POMS) Questionnaire. Top end Sports Website. 2017, https://www.topendsports.com/psychology/poms.htm, Accessed 12/17/2018
87. Woods AL, Garvican-lewis LA, Lundy B, Rice AJ, Thompson KG. New approaches to determine fatigue in elite athletes during intensified training: Resting metabolic rate and pacing profile, 2017. DOI: 10.1371/journal.pone.0173807
88. Zografova Y. Some Of The Challenges Facing Society And Social Psychology; Institute For Population And Human Studies, Bulgarian Academy Of Sciences, Bulgaria. 2016; 10(1). Issn: 2029-8587.
89. Zatsiorsky VM. Biomechanics in Sport. Performance Enhancement and Injury Prevention: Volume IX, Encyclopaedia of sport medicine IOC Medical commission; Jonkopping University; Blackwell Science, 2000.