

# Macrostructure and Use of Nominalizations in Applied Sport Science Abstracts in the Internet

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*Abstracts have an informative function, i.e. summarising the contents of the research article, and a persuasive function, i.e. persuading the reader of the worthiness of the whole research article. This paper aims at showing that abstracts need to meet certain requirements in order to fulfil those two functions and be accepted by the members of the community they are addressed to. Ten abstracts belonging to the discipline of Applied Sport Science were downloaded from the net and studied. It was found that, possibly due to their practical function, a particular rhetorical structure and a certain linguistic phenomenon —the use of nominalizations— recur. It is intended to signal that these two aspects do not only perform an ideational function but also a very significant interpersonal one.*

## 1. Introduction

The research article abstract is a fairly recent genre and developed as a necessity felt by those who needed or wanted to keep up-to-date in the fast-moving world of scientific knowledge, becoming a very functional and time-saving genre. These days, nearly all essays—whether originally written in English or not—are accompanied by an abstract written in English, which ensures that the «results of the scientific work done will get worldwide circulation» (Ventola 1994b: 298). As Santos (1996: 482) puts it «abstracts have increasingly become a highly common and almost obligatory genre in the primary communication of research findings, owing perhaps precisely to their usefulness». This extended use of abstracts has led to an increasing linguistic study and analysis of this genre<sup>1</sup>, although a lot is still to be done, for instance, on relating particular linguistic phenomena to specific moves or on the subdivision of this wide genre.

As a distinctive genre, the research article abstract has a specific communicative purpose, i.e. to summarise the main points later on developed in the research article itself and, most importantly, to con-

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<sup>1</sup> Ventola (1994a; 1994b), Santos (1996), Hyland (2000)

vince the reader that the article is good enough to be thoroughly read. It is also characterised by a particular rhetorical organization and particular linguistic features that are used in order to fulfil those two functions. As Hyland (2000: 68) points out «the abstract is an eminently promotional genre». An abstract does not only try to persuade the reader of the veracity of the results obtained, or of the adequacy of the methods used, but it also tries to convince the reader of its significance and credibility (Hyland 2000: 63). It must be considered semantically, textually and linguistically adequate by the target discourse community to whom it is addressed. An interpersonal component —as in any process of communication— plays as relevant a role as the ideational one.

This essay intends to show that a certain rhetorical structure is needed as well as the use of specific linguistic phenomena, such as the ‘ideational grammatical metaphor’, in order to come up with an abstract that condensates the main points of the essay and, above all, shows ‘inner membership’ and relevance, adjusting to the scientific community common practices. The particular linguistic phenomenon to be analysed will be, as far as possible, related to the global structure of the abstract taking into account Ventola’s statement (1994a: 345) that «various types of counts might prove more useful and significant to writers if one could show the writers how certain linguistic realizations can be related to certain part of the global structure of the text».

## 2. The corpus

The overall textual structure as well as the ‘ideational grammatical metaphor’ have been studied in ten abstracts on Applied Sport Science that were downloaded from the following website: [www.rohan.sdsu.edu/dept/coahsci/index.htm](http://www.rohan.sdsu.edu/dept/coahsci/index.htm). I found Applied Sport Sci-

ence abstracts interesting for my analysis due to their very practical nature and because Applied Sport Science is a fairly recent discipline, on which not much, if any, linguistic analysis has been carried out. The fact that they were taken from the Internet makes their study even more appealing.

At that website a great number of abstracts can be found; they are grouped into seven volumes according to their subject matter, each volume including five or six issues. The selected abstracts were taken from the seventh volume, issue number four entitled *Overload and Overtraining 3*. Out of the twenty six abstracts to be found under this heading, the ten most recent ones were chosen. There is no access to the complete articles. The abstracts are clearly referenced so that the reader can go and find the whole article in paper format, but they are not gathered there. This may imply that those abstracts have a quick-consulting function and are, consequently, eminently practical, which would explain the inexistence of previous research citation, the limited statement of purpose and the highlighting of an implication move.

## 4. DATA ANALYSIS

### 4.1. *Global structure*

According to the division into *indicative* and *informative* abstracts proposed by Ventola (1994a: 335), the ones here presented would be considered *informative*. *Informative* abstracts are «typical of the natural sciences» and tend to «reflect the IMRD-structure of the research paper» (1994b: 288). The so-called IMRD-structure consists of four rhetorical moves, namely, 'introducing purpose', 'describing methodology', 'summarizing results' and 'presenting conclusions' (Bhatia 1993: 78-79) and not all of them are contained in the abstracts studied. The table below shows the use of these four moves:

INTRODUCTION (purpose, aim etc..)	3
METHODS	6
INTRODUCTION +METHODS	5
RESULTS	10
CONCLUSIONS	4

It can be concluded that two abstracts presented no introduction, and those that did, presented it very briefly; that all of them stated the procedure (in abstract number 5, the methodology is already pointed out in the first move mingling with the explanation of goals and is later on developed in a separate move, that is why the total number of abstracts —if summed up— would be 11) as well as the results; and that not even half of them included a conclusion.

Embedding ‘introducing purpose’ and ‘describing methodology’ —which occurred in half of them— «is very common in abstracts, particularly of experimental studies» (Bhatia 1993: 89). This ‘move embedding’ practice is according to Santos (1996: 497) «a major genre-specific feature of abstracts». This merging of two moves into one could be considered an effort on the part of the writer to save space, given the constraints of this genre, but by so doing the writer may have another intention, he «can insinuate the appropriacy of the technique by strategically linking the approach in an unproblematic and reasonable way to accomplish the research objective» (Hyland 2000: 73-74), thus, fulfilling a persuasive goal.

However, there is one more move that all abstracts under study present. This fifth move is signalled by an overt nominalization

(«implication») that will be afterwards commented on. This nominalization gives way to a summary of the results, which, on closer examination, can be taken to be a reformulation of the title. It can be said then that a variant of that IMRD-structure offered by Bhatia (1993: 78-79) and Ventola (1994a: 337-338) is present here. If none of the abstracts had presented a conclusion move, then, that implication-section could have been interpreted as such, but since some of them already present such a move, a further one can be thought to be developed. Furthermore, this last move is highlighted, thus, acquiring a special meaning. It has probably become a requisite; in fact, it is present in all abstracts compiled. It can be thought to be an aid for the reader to immediately find what is most relevant, having in mind that this site is intended to coaches seeking immediate application of what they read. But it can also be thought to «explicitly emphasise the value of the paper, either to the disciple or to the wider community» (Hyland 2000: 74). It would be a way of convincing the reader of the validity of what has been found, a way of claiming relevance.

Rhetorical moves can be considered to fulfil an ideational function, that of providing information in a clear step-by-step way, but they can also be considered to perform a more interpersonal function already stated in the introduction: to comply with what is expected by the scientific community. The intended readers (coaches) expect to find a description of the methodology used, the results and, above all, the implication those results have for their own professional daily activity. Including these three essential moves may be the best solution to get an accepted, most adequate and fully practical Applied Sport Science cyber-abstract:

Move 1	Methods
Move 2	Results
Move 3	Implication

This simplest global structure (exemplified by abstracts 7 and 10) can be considered most successful, since everything that is considered superfluous, avoidable in terms of practical application—and, therefore, time-consuming—has been left out.

Only by complying with the coaches' expectations will the reader be persuaded to take that research into consideration. By sounding credible and relevant—mainly achieved by drawing attention to the implications—will the writer of the abstract get «to sell the research being offered» (Santos 1996: 485).

#### 4.2. *Nominalised discourse*

##### 4.2.1. *The ideational grammatical metaphor*

Both its rhetorical structure and certain linguistic features contribute to accomplishing the communicative intention(s) of the research article abstract and, consequently, to distinguish it from other genres. The great number of 'ideational grammatical metaphors' found in the abstracts has contributed to the selection of this linguistic feature for study:

Abstract No. 1	Abstract No. 2	Abstract No. 3	Abstract No. 4	Abstract No. 5	Abstract No. 6	Abstract No. 7	Abstract No. 8	Abstract No. 9	Abstract No. 10
14	18	20	20	31	29	6	15	21	10

According to Halliday (1985: 352), nominalizations are the «most powerful resource for creating grammatical metaphor». Therefore, 'metaphoric nominalizations'—those nominalizations that mask a

process, a quality or a relation within the context in which they appear—are going to be analysed here. The ideational grammatical metaphor involves ‘transcategorising’, that is, it semantically implies turning processes, qualities or logical connections into entities, and they syntactically imply turning verbs, adjectives, circumstances and relators into nouns.

Nominalizations are considered extremely useful resources for such a space-limited genre as the abstract. Nominalizations can package or condensate a process that could be also expressed in a more iconic or congruent way and, therefore, more easily processed but, at the same time, it can be argued that it would be more lengthy. Furthermore, it complies with the scientific postulate that maximum information has to be encoded in the minimum number of words. It might also be considered—together with the use of the passive—a very helpful resource to blur the researcher’s identity, since nowadays it is unquestionable that science is above the individual; thus, by using nominalizations, the research itself rather than the researcher is foregrounded. However, it will be argued that nominalizations are not only used in order to be linguistically economical or to emphasize the study, but that they may respond to more interpersonal factors.

Halliday (1998, 1999) distinguishes between ‘instantial’ and ‘systemic’ constructs. ‘Instantial constructs’ are those nominalizations «created for the immediate requirements of the discourse» (1998: 221); that is, they are used for discourse purposes in order to create reasoned arguments and they can be ‘unpacked’. ‘Systemic constructs’ are those nominalizations «created for the long-term requirements of the theory» (1998: 221); that is, they become technical terms, they have fossilized and can no longer be ‘unpacked’. There are examples of both types of ‘metaphoric nominalizations’ in the abstracts under study:



## Examples of 'instantial constructs':

*Variability* (Abstract No. 4) There is a suggestion that HMT might be a training state indicator but its variability in and out of significance as an intense week of training progressed warrants further assessment of its validity.

*Responses; reactions* (Abstract No. 10): While HR characteristics change in overtrained states, the nature of the changes is not consistent between female athletes. VO<sub>2</sub>max is also reduced in some athletes. However, a universal pattern of responses to excessive training does not exist. Physiological reactions to overtraining are particularly individual.

*Recovery* (Abstract No. 4): The *Health Maintenance Test* (HMT — morning heart rates following 5-min rest, 30 deep knee bends, 60-sec recovery) was monitored during five consecutive days of high-intensity interval training. Male competitive cyclists (N = 5) were monitored for one week of baseline assessment, one of the experimental intervention, and a further week of recovery.

*Performance* (Abstract No. 5): Overload training changed neither the performance nor the factors concerning performance.

*Intensity* (Abstract No. 10): (at an intensity of 70-90% VO<sub>2</sub>max)

## Examples of 'systemic constructs':

*(Over)training* (Abstract No. 9): Disruptions in sleep and appetite were less common. Mood disturbance was elevated during overtraining excepting for Japanese swimmers.

(Abstract No. 1) Any use of these measures should be on an individual basis at no more than a three-day interval. If large increases are noted after a period of heavy training/exertion, then overtraining/overreaching is very likely.

*Exercise* (Abstract No. 3): S-RPE can assess the relative exercise loading during interval training as well as during steady state exercise.

*Staleness* (Abstract No. 9): Training practices, staleness, and staleness symptoms were compared across several countries for age-group swimmers (Japan = 41; USA = 43; Greece = 111, Sweden = 22).

*Implication* (in all Abstracts).

The latter are fixed, unchangeable and expected. Specific instances of the former are not expected, what a reader probably

—and even unconsciously— expects is a discourse that involves the use of nominalised discourse, not the above stated nominalizations in particular.

The nominalization *implication* deserves detailed explanation. It is a bold nominalised expression that serves to overtly signal the beginning of probably the most significant move in the abstract. Since it appears in all the selected abstracts, it is no longer to be considered a term that favours the chain of reasoning, but rather it might be better considered a technical term that must be included since it is expected and —possibly looked for— by the reader. It can no longer be ‘unpacked’, a more congruent expression, such as, the research, or rather, the results of the research imply the following/that... is no longer possible because the existent literature has accrued to form a particular macro-text (Halliday 1999: 109) and this may imply the appearance of such a highlighted nominalised expression.

The noun *purpose* in abstract number 3 can be seen as functionally very similar to the abovementioned nominalization; it explicitly introduces a move but the difference is that this function is accomplished by an abstract noun not by a ‘metaphoric nominalization’. Besides, it only appears in one of the abstracts and is part of the discourse, it has not been isolated and emphasised because it is less relevant for the intended audience.

Within the group of ‘instantial construct’ presented above, there are two different types of nominalizations. On the one hand there are those which condensate a process, such as, for instance, *performance*, *recovery*, *responses*, and on the other hand there are those which encapsulate a quality, *variability*, *intensity*. A more everyday-like expression (an Attic version) could be offered, in which the verbal process or the quality is made explicit as it is shown in the table below:

Doric variant	Attic variant
Abstract No. 1 <i>Chronically depressed performance...</i>	That athletes perform in a chronically depressed way...
Abstract No. 4 <i>...a further week of recovery.</i>	a further week when athletes can recover
Abstract No. 2 <i>Varied and disruptive responses...</i>	If they/athletes respond variedly and disruptively...
Abstract No. 4 <i>...Suggesting accumulated fatigue.</i>	...suggesting that athletes had become tired.
Abstract No. 6 <i>...program consisting of ...and low intensity</i>	...not very intense exercises.

In the popularised versions provided above, all the participants are included and the semantic relation between them is made explicit. However, when experience is turned into things, when processes or qualities become metaphorical —as it happens in scientific reporting— «a great deal of semantic information is lost» (Halliday 1993:78). The discourse very often becomes «syntactically ambiguous» (1993: 71).

Apart from leaving participants out and, thus, creating ambiguity, ‘metaphoric nominalizations’ lead to an accumulation of lexical or content words —sometimes new nominalizations— around it. The result is the construction of lexically dense nominal groups such as the ones presented below (the Thing has been underlined):

*Daily determinations of serum urea and serum creatine kinase...  
 ...further assessment of its validity.  
 ...recovery running at 60% of vVO2max pace,...  
 ...high-volume low-intensity training...  
 ...perception of training effort followed by a feeling of heaviness.  
 Psychological reactions to overtraining...*

The elimination of semantic information together with the lexical density stated above makes the reading of abstracts more difficult and sometimes they become inaccessible for non-informed readers. It has already been pointed out that the use of this linguistic phenomenon is a very useful space-saving resource and it also facilitates the flow of information, allowing meaning to accrue, but it might be argued that the reason that lies behind its use has a more interpersonal basis.

The scientific community expects such an economical, abstract, nominalised discourse. Besides, it might be intended to be understood only by specialists. Language would then create a barrier between insiders and outsiders of that scientific community, that is, between experts and laymen. It can be argued as well that a completely iconic discourse would be too lengthy, childish, shocking and not even totally possible. However, such nominalizations may also claim both 'inner membership' and relevance; as Martin (1993: 217) puts it «one might argue that nominalised language is simply a symbol of literacy and thus education and thus power in our culture. So for resolutions to sound credible they must be written in language of this kind». Those nominalizations contribute to the promotion of the results found, to the «selling» of credible findings by complying with what is expected and by sounding reliable. An abstract that did not include a nominalised discourse, would not be considered appropriate nor accepted and, consequently, it would fail in its main communicative intention, namely, to promote the research carried out.

#### *4.2.2. The favourite clause type*

Halliday (1993: 206-208) states that there is what he calls a 'favourite clause type' in scientific writing. This clause consists of three elements: two nominal groups linked by a process verbal group. In this type of clause a combination of metaphorical features takes

place. He states two variants forms in which the verbal group expresses an attributive or an existential process. These ‘favourite clauses types’ are present all over the abstract, but they are especially used in the «implication» move as is shown below (only two abstracts present no ‘favourite clause type’ or a variant form of it).

‘Favourite clause type’ in the ‘implication’ move:

NG	VG	NG
<i>Varied and disruptive responses</i>	<i>should be used as</i>	<i>signals that training is excessive.</i>
<i>...its variability in and out of significance [...]</i>	<i>warrants</i>	<i>further assessment of its validity.</i>
<i>Moderate increases in workload</i>	<i>do not necessarily induce</i>	<i>overtrained states.</i>
<i>Changes in biochemical indices of stress</i>	<i>may be associated with</i>	<i>increased reports of symptoms of stress and decline in general health.</i>

Variant forms with ‘relational: attributive’ process in the ‘implication move’:

NG	VG	NG
<i>Session-RPE</i>	<i>is</i>	<i>a useful method for judging exercise intensity...</i>
<i>Increasing the volume of high-intensity training for athletes [...]</i>	<i>is</i>	<i>a likely avenues for performance improvement.</i>
<i>Staleness/overtraining</i>	<i>is</i>	<i>symptomatically similar in age group and ....</i>
<i>Psychological reactions to overtraining</i>	<i>are</i>	<i>particularly individual.</i>

Variant forms with ‘relational: existential’ process in the ‘implication move’:

NG	VG
<i>A universal pattern of responses to excessive training</i>	<i>does not exist.</i>

It can be observed that the two nominal groups in most cases have a ‘metaphoric nominalization’ as Thing, and that, as has been said in the previous section, many lexical or content items are organized around it.

In the global structure section, it was already stated that such a move draws attention to itself, it stresses the validity and relevance of what has been found. The use of the ‘favourite clause type’ in this move contributes to sounding categorical and relevant, «the elaborated, nominalizing grammar of science imposes determinacy, constancy and stasis» (Halliday 1993:110).

Nominalizations can be considered to have both an ideational and an interpersonal function —especially outstanding in the last move which is significantly encoded by a nominalization. They enable to write a compact, economical abstract that is accepted as adequate by the community and it, therefore, succeeds at claiming relevance and membership.

## **5. Conclusions**

To sum up, it can be said that Applied Sports Science abstracts in the net seem to have a special global structure that helps professionals to save time and to immediately focus their attention on what is most relevant for them. That global structure, which emphatically draws attention to the implications of the research, may be due to the practical aim of these abstracts and to their quick-consultation function.

The ‘metaphoric nominalised’ language used throughout the abstract demands greater effort on the part of the reader than a more congruent mode of expression, but it is necessary for the results to be taken seriously and for the writer to be able to condensate a good deal of information in a limited number of words. The last move

makes a special use of nominalizations by means of the ‘favourite clause type’, whose aim seems to be to promote the research by sounding valuable and credible.

Being aware of the importance to include and stress certain moves, and also of the consequences of the use of nominalizations in certain moves might facilitate the production of adequate, accepted Applied Sports Science abstracts as well as their reading and full understanding. Having a particular rhetorical structure and the convenience of using nominalizations in mind might help especially non-experts to write their abstracts so that these are seen as appropriate by the community and urge their addressees to read the whole article.

It would be interesting to investigate further into the subject to see whether other-discipline abstracts in the net present a similar rhetorical structure and whether the use of nominalizations and, particularly, of the ‘favourite clause type’ recurs in certain moves, as it happens in the corpus analysed. It would be of great interest as well to study whether there are significant differences between ‘cyber’ and paper abstracts. The analysis could maybe lead us to the discovery of a separate genre with a more specific communicative function that favours certain linguistic elements.

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## APPENDIX

Abstract No. 1

### TWO OBVIOUS MARKERS OF OVERREACHING/OVERTRAINING

Hartmann, U., & Mester, J. (2000). Training and overtraining markers in selected sport events. *Medicine and Science in Sports and Exercise*, 32, 209-215.

Daily determinations of serum urea (SU) and serum creatine kinase (CK) were made on rowers and international athletes of both genders. SU values for women were approximately 1.5 mM lower than males. Male CK values tended to be at least twice the levels of those for women. The extreme individual variability meant the reporting of averages and standard deviations was meaningless. Any use of these measures should be on an individual basis at no more than a three-day interval. If large increases are noted after a period of heavy training/exertion, then overtraining/overreaching is very likely.

**Implication.** The use of serum urea or serum creatine kinase on an individ-



ual basis is likely to verify overtrained/overreached states if measures are considered individually, frequently, and over a long period. [Chronically depressed performances will be evidenced long before either of these markers reacts.]

Abstract No. 2

### **OVERREACHING PRODUCES MORE DISRUPTIVE SYMPTOMS THAN OVERTRAINING**

Brechtel, L. M., Braumann, K. M., & Wolff, R. (1999). Time course of symptoms during the development of a parasympathetic overtraining syndrome. *Medicine and Science in Sports and Exercise*, 31(5), Supplement abstract 786.

The effects of seven weeks of overtraining (increased training volume and intensity) on long-distance runners (N = 7) were evaluated weekly. Symptoms of overload (overreaching) emerged after three weeks of training, and overtraining was exhibited after 5.5 weeks of the experience. The total number of musculoskeletal, health, sleep, and mood changes increased in overload training, but were reduced, but not back to normal, in overtraining. Disruptive symptoms remained for up to four weeks after termination of the study.

**Implication.** Overreaching produces more and varied disturbance symptoms than when an athlete is overtrained. Varied and disrupted responses should be used as signals that training is excessive.

Abstract No. 3

### **RPE IS USEFUL FOR ESTIMATING WORK INTENSITY**

Hrovatin, L. A., Florhaug, J. A., Brice, G., Esten, P. L., Mikat, R. J., & Foster, C. (2000). Effect of interval duration on markers of exercise training intensity. *Medicine and Science in Sports and Exercise*, 32(5), Supplement abstract 1567.

The purpose of this study was to evaluate the ability of S-RPE to evaluate training load during interval training, with different durations of the hard/easy segments. Recreational athletes (N = 12) performed a 30-min bout at 90% of anaerobic threshold. Each also performed interval training at the same mean power output, but with hard/easy (1:1 ratio) segments of 0.5, 1.0, and 2.0 minutes (power output during hard/easy were + 25% steady state). Training load was calculated using the S-RPE method and a summated heart rate score, based on heart rate zones (HR-Z) related to HRmax.

Regression lines for both methods were essentially the same. Both S-RPE and

HR-Z methods were related to objective markers of exercise intensity (VO<sub>2</sub> and blood lactate).

S-RPE can assess the relative exercise loading during interval training as well as during steady state exercise.

**Implication.** Session-RPE is a useful method for judging exercise intensity during variable workload activities (interval training) as well as steady state exercise.

Abstract No. 4

### TRAINING INDICES VARY WHEN CYCLISTS UNDERGO HARD TRAINING

Hill, M. R., Motl, R. W., & Johnson, S. C. (1998). Health maintenance test responses to five consecutive days of high intensity cycling. *Medicine and Science in Sports and Exercise*, 30(5), Supplement abstract 612.

The *Health Maintenance Test* (HMT — morning heart rates following 5-min rest, 30 deep knee bends, 60-sec recovery) was monitored during five consecutive days of high-intensity interval training. Male competitive cyclists (N = 5) were monitored for one week of baseline assessment, one of the experimental intervention, and a further week of recovery.

The HMT, resting and recovery heart rates, when compared to baseline, were significantly increased on days 1 and 5 of the interval-training week. Days 2, 3, and 4 were not different to baseline values. Heart rates did not change during the week of training. Creatine kinase was significantly higher on day 5 of interval training than on day 1 suggesting accumulated fatigue.

**Implication.** There is a suggestion that HMT might be a training state indicator but its variability in and out of significance as an intense week of training progressed warrants further assessment of its validity.

Abstract No. 5

### MODERATE INCREASE IN OVERLOAD NOT SUFFICIENT TO INDUCE OVERTRAINING

Billat, V. L., Flechet, B., Petit, B., Muriaux, G., & Koralsztein, J-P., (1999). Interval training at VO<sub>2</sub>max: Effects on aerobic performance and overtraining markers. *Medicine and Science in Sports and Exercise*, 31, 156-163.

The influence of a defined increase in training volume at vVO<sub>2</sub>max on aerobic performance, noradrenaline, and heart rate was investigated.

Ss (N = 8) followed four weeks of normal training. One session per week was at vVO<sub>2</sub>max, comprising five repetitions run at 50% of the time that could be performed to maximum at vVO<sub>2</sub>max pace, each followed by recovery running at 60% of vVO<sub>2</sub>max. A further four weeks of «overload» training was performed with the number of vVO<sub>2</sub>max sessions being increased to three per week.

vVO<sub>2</sub>max training improved running velocity associated with VO<sub>2</sub>max. Running economy increased but VO<sub>2</sub>max did not change. Time to exhaustion at vVO<sub>2</sub>max did not change nor did distance run at vVO<sub>2</sub>max. Overload training changed neither the performance nor the factors concerning performance. Sub-maximal heart rate decreased, and plasma norepinephrine at the end of a test effort increased, after overload training.

These minimal changes suggest that the increased training load was not heavy enough to induce overtraining in the relatively short period of observation.

**Implication.** Moderate increases in workload do not necessarily induce over-trained states.

Abstract No. 6

### **INCREASE HIGH-INTENSITY VOLUME FOR ATHLETES WHO ARE NOT IMPROVING**

Gaskill, W. E., Serfass, R. C., Bacharach, D. W., & Kelly, J. M. (1999). Responses to training in cross-country skiers. *Medicine and Science in Sports and Exercise*, *31*, 1211-1217.

This study evaluated whether national level US cross-country skiers, who did not respond positively to a training program consisting of high volume and low intensity, would improve if high-intensity training volume was doubled during a subsequent training year.

Cross-country skiers (N = 14) were evaluated for VO<sub>2</sub>max, VO<sub>2</sub>threshold, lactate response, maximum arm power, and competitive results after a year of training. During the following year, Ss were divided into a control group (those who responded well to training in the previous year; N = 7) and a treatment group (those who responded poorly the previous year; N = 7). The treatment involved training modification to increase high-intensity training time (from <17% to >35%) as part of the total training experience, which was similar in volume for each year.

Significant improved differences for the treatment group for all five variables and none for the control group were observed. Competitively, the treatment group

improved to the level of the control group, which also had a marginal, but non-significant, performance improvement in the second year.

**Implication.** Increasing the volume of high-intensity training for athletes who are not responding to high-volume low-intensity training is a likely avenue for performance improvement.

Abstract No. 7

### FIVE DAYS OF COMPETITIONS AFFECT SOME BIOCHEMICAL FACTORS

Yau, C. Y. (1999). The effects of a five-day competition on the blood biochemistry of young male athletes. *Medicine and Science in Sports and Exercise*, 31(5), Supplement abstract 118.

Male (N = 17) college tennis and table tennis players were studied before, during, and after a five-day sports competition.

Most blood and urine factors showed changes ranging from 0% – 36%, but all remained within a normal range. Post-competition cortisol, dopamine, IgA, and IgG dropped significantly, and calcium and A/G ratio values increased significantly when compared to precompetition levels.

**Implication.** Some biochemical factors change during extended competitions, but do not affect short-term health.

Abstract No. 8

### STRESS SYMPTOM INCREASES IN AGE-GROUP SWIMMERS ARE ASSOCIATED WITH BIOCHEMICAL CHANGES

Kerr, G., VanHeest, J. L., & Rodgers, C. D. (1998). Changes in psychological and biochemical indices of stress across a competitive season in age-group swimmers. *Medicine and Science in Sports and Exercise*, 30(5), Supplement abstract 502.

Age group swimmers (M = 18; f = 12) were assessed at various stages of a competitive season for psychological stresses (*Daily analyses of Life Demands for Athletes*) and on biochemical factors (salivary IgA and cortisol levels).

Over a five month period there was no difference in the sources of perceived stress, but significant increase in the number of stress symptoms and cortisol levels and a decrease in salivary IgA levels.

**Implication.** Changes in biochemical indices of stress may be associated with increased reports of symptoms of stress and decline in general health.

Abstract No. 9

### **OVERTRAINING IS SYMPTOMATICALLY SIMILAR IN AGE-GROUP AND ADULT ATHLETES**

Sawamura, S., Raglin, J., Alexiou, S., Hassmen, P., & Kentta, G. (1998). Training practices and staleness in age-group swimmers: A cross-cultural study. *Medicine and Science in Sports and Exercise*, 30(5), Supplement abstract 503.

Training practices, staleness, and staleness symptoms were compared across several countries for age-group swimmers (Japan = 41; USA = 43; Greece = 111, Sweden = 22).

It was found that symptoms of staleness were consistent across countries. The commonest symptom was perception of training effort followed by a feeling of heaviness. Disruptions in sleep and appetite were less common. Mood disturbance was elevated during overtraining excepting for Japanese swimmers.

The percentage of young swimmers who reported staleness was comparable to the percentage of adult non-elite athletes reporting similarly.

**Implication.** Staleness/overtraining is symptomatically similar in age group and adult training populations.

Abstract No. 10

### **OVERTRAINING PRODUCES INDIVIDUAL HEART RATE AND VO<sub>2</sub>max RESPONSES**

Uusitalo, A. L., Uusitalo, A. J., & Rusko, H. K. (1999). Heart rate and blood pressure variability during heavy training and overtraining in the female athlete. *International Journal of Sports Medicine*, 20, 45-53.

Young female athletes (N = 9) increased training volume (at an intensity of 70-90% VO<sub>2</sub>max) by 125% for 6-9 weeks. A corresponding increase in work-volume in control (N = 6) athletes was 5-10%.

VO<sub>2</sub>max did not change in either group. However, in five experimental athletes it decreased significantly. Heart rate factors were altered in various HR tests (supine and standing). The nature of observed changes were individual.

**Implication.** While HR characteristics change in overtrained states, the nature of the changes is not consistent between female athletes. VO<sub>2</sub>max is also reduced in some athletes. However, a universal pattern of responses to excessive training does not exist. Physiological reactions to overtraining are particularly individual.