The Planning of Training for Highly Qualified Alpine Ski Racers: The Philosophies of Expert Coaches

Master's Thesis in Sport

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To Kristi, Tricia, and Michael,

With love.

Forword

There are a number of individuals who have contributed to this thesis to whom I would like to express my appreciation. First, and foremost, I would like to thank Per Haugen, the chairman of my thesis committee. Your guidance, support, and friendship over the last three years have played a vital role in the completion of this thesis. Thank you.

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the report provides interesting reading for both you and future coaches.

Robert C. Reid

June, 2000

Oslo, Norway

Abstract

The purpose of this study was to examine the philosophies of expert coaches regarding the design of the annual plan for highly qualified alpine ski racers. In-depth, unstructured interviews with fourteen expert coaches from six different countries were completed. Using the methods of grounded theory (Strauss & Corbin, 1998a; Strauss & Corbin, 1998b; Tesch, 1995), a five-tiered, hierarchical categorization scheme was inductively created from the analysis of the interviews. The first three tiers of categories represented aspects of the annual plan that the interviewed coaches described as important to consider in planning. These were referred to as classes of decision categories; decision categories; and sub decision categories. Important aspects of the annual plan to consider included on snow training, dryland training, recovery, equipment testing, competition, and the timing of sporting form. Also of interest were the philosophies of the coaches regarding the various decision categories and sub categories. These philosophies, referred to as decision variables, comprised the final two levels of the categorization system. Important decision variables to consider in designing the annual plan included the importance of a high quality and effectiveness of on snow training; constraints including travel, budget, tradition, and the instability of weather and snow conditions; and synergy. It seems that expert coaches plan training according to a model that integrates aspects from both training theory and experience.

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List of Abbreviations

CAR	Current adaptation reserve
CSP	Competition specific preparation
FIS	Internation Ski Federation
GP	General preparation
LLTE	Long term lag in the training effect
SP	Specific preparation
USSA	United States Ski and Snowboard Association

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PART 1. INTRODUCTION, STATEMENT OF THE PROBLEM, AND METHODS

CHAPTER 1. INTRODUCTION

1.1 Background and Purpose of the Study

Over the past century, there has been a rapid evolution in the preparation of athletes for sport due to the combined influences of experience, competition, and scientific inquiry. For instance, one readily noticeable aspect that has changed is the sheer volume of training. As recently as the early 1900's, authors generally advocated a preparation period of two to three weeks in duration (Pedemonte, 1986a). Since then however, the volume of training has increased dramatically (Kipke, 1987; Matveyev, 1994; McInnis, 1981; Pedemonte, 1986a; Verhoshansky, 1996).

For example, one study of weightlifters from the former Soviet Union reported an increase in training volume from an average of just under 9,000 repetitions per year in 1964 to an average of 21,000 repetitions per year in 1980, with some athletes completing as many as 50,000 repetitions (Dreschler, 1998). Similar increases in volume have also been observed in swimming where it has been reported that athletes routinely train 10 to 20 times the daily distance they once did 30 years ago (Kipke, 1987). Increases in training and competition volumes have been reported in most sports, including alpine ski racing (Aambø, 1992). Preparation for competition at a high level in sport has indeed become a year-round, full-time pursuit.

While such increases in training volume have lead to enhanced levels of performance (as indicated by improving world records), they have also lead to potentially career-ending problems such as burn-out and overtraining. This has stimulated great interest and discussion as to how training should be structured to maximize performance and minimize the risk of overtraining. Over the last half of the 20th century, much has been written on the theory of training and certain principles have gained acceptance in the literature (See for example: Bompa, 1999; Dick, 1997; Gjerset & Vilberg, 1995; Harre, 1982a; Matveyev, 1977/1981; Verkhoshansky, 1985/1988; Viru, 1995). However, as I have come to find, difficulties can arise in the actual planning and eventual implementation of training that can make the application of these principles not always as straightforward as it would seem.

My personal interest in this area was first ignited when, in the spring of 1993, I accepted a job as an assistant in the sport science department of the United States Ski and Snowboard Association (USSA)[1]. In this position, one of my primary responsibilities was to work with coaches to develop training plans for the national alpine teams. Concurrently, I also worked as an assistant coach, with both on snow and conditioning responsibilities, to divisional and regional level racers at an American ski academy.

It is fair to say that when I started these two jobs, I was young (22 years old), right out of school, and had very little experience. This meant that my knowledge regarding training was primarily limited to what I had learned at an American university, where I had studied undergraduate exercise and sport science, and during my short career as a divisional level alpine ski racer in the

United States. Conversely, the coaches with whom I had the fortune to work, at both the academy and the national team, were very experienced.

In working with these coaches, I felt a very limited application for the theory that I had learned in school. In fact, as I look back now I can remember some embarrassing mistakes that I made in the name of theory. A coach has to prioritize the most important issues with which to deal in planning training. In this respect, I often found myself guilty of what I would call a “faulty” prioritization. Or, if not faulty, I had at least a different prioritization when compared to those of the far more experienced coaches with whom I was working. This created a good deal of confusion on my part as I was forced to seriously re-examine much of what I had learned in school.

I also do not think that I was alone with this feeling. I had the impression that some of the coaches with whom I was working and advising also experienced frustration as they tried to assimilate the theory coming from sport science with their practical experience. This frustration once expressed itself when a coach described the sport science department at USSA as sitting in the “ivory tower of academia,” outside of the reality in which the actual teams trained and competed.

This gap between theory and practice is not unique to my situation. Numerous authors have described this issue previously (Freeman, 1995; Horwill, 1991; Horwill, 1992; McInnis, 1981; Ozolin, 1972; Salmela & Russell, 1994; Sands, 1995; Schumacher, 1999). I believe that Balyi (1992) pointed to the essence of this problem when he

[1] USSA is the national governing body for skiing and snowboarding sports, including alpine ski racing, in the United States.

distinguished four historical models with regard to training theory (Figure 1.1). Although there is certainly

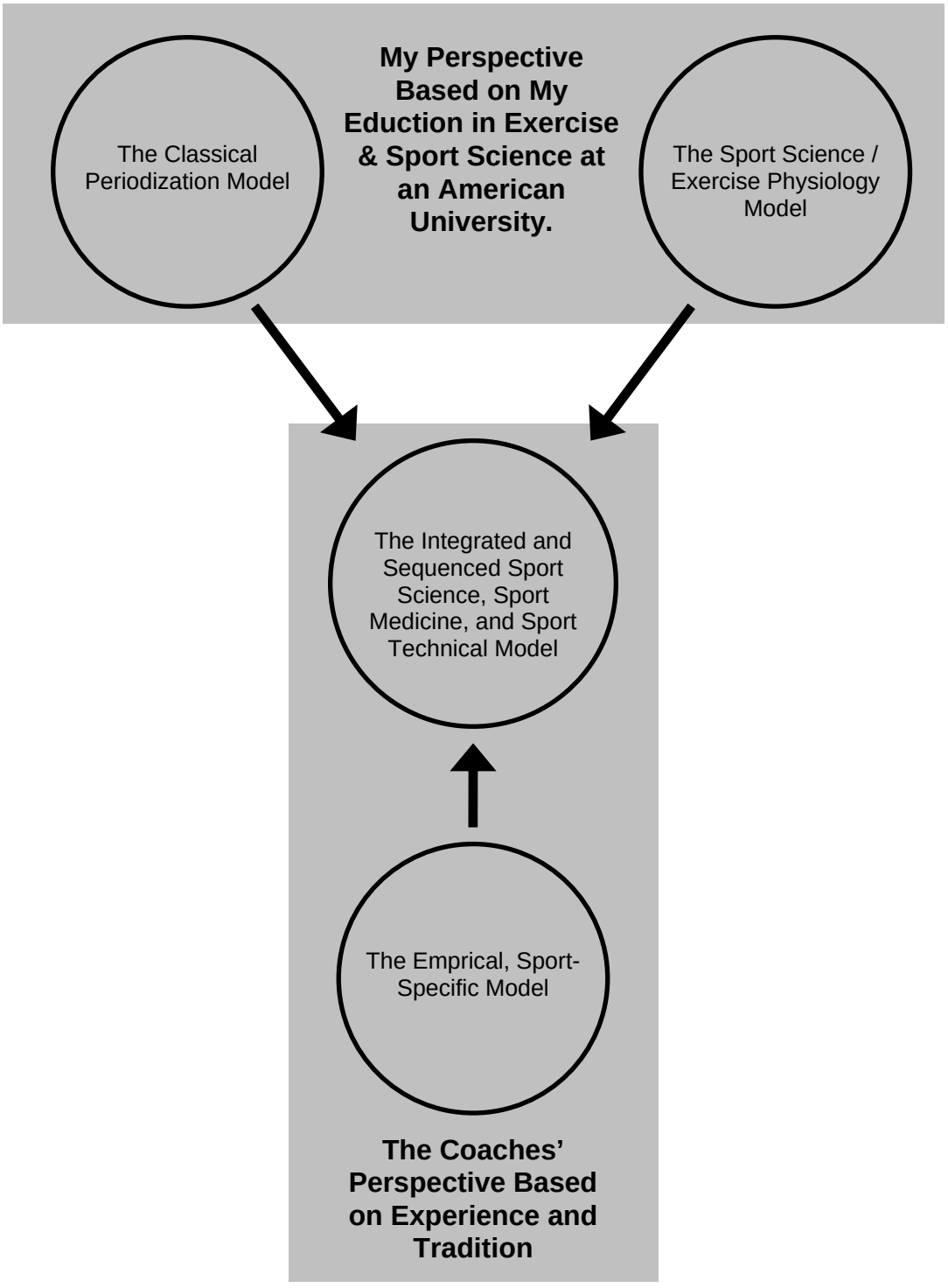

Figure 1.1 My interpretation of the four historical models as defined by Balyi (1992) and how they relate to the differences in perspective that I felt between the coaches with whom I worked and myself. The shading is used to emphasize the difference in perspective and

the resulting gap that exists between theory and practice.

a great deal of similarity and overlap between these models, each one differs significantly from the others by having a slightly different perspective of what is essentially important to consider in the planning of training and competition. I believe that this difference in perspective is the primary cause for the confusion I felt in my work. Each of these models is briefly introduced here and then discussed in greater detail in later sections of this report.

My Perspective: The Classical Periodization and Sport Science / Exercise Physiology Models

My education, and consequently my perspective, was primarily associated with what Balyi (1992) defined as the "Classical Periodization Model" and the "Sport Science / Exercise Physiology Model" (p. 10).

Originally formalized in Eastern European countries and the former Soviet Union beginning in the 1920's (Pedemonte, 1986a), the Classical Periodization Model is the one most commonly associated with training theory in the West. This model first began to emerge in Western societies with the translation of Matveyev's Fundamentals of Sports Training (1977/1981) and Harre's Principles of Sports Training (1982a) (Woodman, 1993).

Beginning in the late 1970's however, sport scientists in Eastern Europe began to criticize the Classical Periodization Model as being primarily a pedagogical / statistical model and for not adequately taking into account the knowledge of physiological processes (Balyi, 1992; Selujanov, 1999). As a result, the Sport Science / Exercise Physiology Model[2] began to take form, and by the late 1980's it was introduced to the West with the

[2] The Sport Science / Exercise Physiology Model will hereafter be referred to as simply the "Exercise Physiology Model."

translation of Verkhoshanksy's Programming and Organization of Training (1985/1988). Numerous authors have since elaborated on this model (Brunner & Tabachnik, 1990; Satori & Tschiene, 1988; Siff & Verkhoshansky, 1996; Tschiene, 1993; Viru, 1995). However, it is still conspicuously absent from most of the English language literature today.

Despite the popularity of these two models in the literature, difficulties exist in their application in the sport of alpine ski racing. I believe that the main difficulty is that the majority of the literature is too general in nature and does not take into account factors for specific sports. Moreover, much of the supporting literature for both models is based on research and experience in relatively closed sports which are practiced in rather stable environments, such as weightlifting, the throwing events in track and field, and swimming (Matveyev, 1994). Many open sports, such as alpine ski racing for example, do not have such a solid basis on which to plan training (Saury & Durand, 1998).

The Coach's Perspective: The Empirical, Sport Specific Model

In contrast to my perspective, the coaches with whom I was working had a point of view based on their experience and what they had learned from the experience of coaches before them. This is what Balyi (1992) termed the "Empirical, Sport Specific Model." (p. 10). This model is often based primarily on the technical development of the athlete and takes into account the sport-specific, logistical constraints including, in the instance of alpine ski racing specifically, the instability of the environment and the need to travel to where there is snow.

In many sports, where the Empirical Model falls short is in integrating much of what has been learned in sport

science with experience (Balyi, 1992; McInnis, 1981; Sands, 1995; Siff & Verkhoshansky, 1996). In alpine ski racing in particular, I have observed that planning is often based primarily on logistical issues with relatively little consideration given to many of the principles that are espoused in the literature. The danger in such a strategy lies in a less than optimal effectiveness in training.

Bridging the Gap: The Integrated and Sequenced Sport Science, Sport Medicine, and Sport Technical Model

Balyi (1992) proposed that progress in improving athlete preparation depends on bridging this gap created by the differences in perspective. This means bringing together the strengths of each model in such a way that accommodates the constraints of the sport. The result of this combination is what Balyi refers to as the "Integrated and Sequenced Sports Science, Sports Medicine, and Sport Technical Model"[3] (p. 10) of planning (Figure 1).

Based on my experience, I feel that most coaches believe that sport science can have a positive impact on their training and are thus beginning to incorporate certain aspects of the Classical Periodization and Exercise Physiology Models into their training. In other words, they are already beginning to work with an integrated model that takes into account some of the key aspects of the other three models. However, this begs the question as to which aspects of the Classical Periodization, Exercise Physiology and Empirical models are these coaches incorporating into their training and how are they adapting them to meet the demands of the real world in alpine ski racing? Very little of this knowledge exists in any form other than in the minds of expert coaches.

[3] For the sake of simplicity, I will hereafter refer to this model as the "Integrated Model."

Therefore, the purpose of this research is to assist in bridging the gap to the integrated model by probing the experiential knowledge of expert coaches in alpine ski racing and discussing their philosophies against the background of the available literature.

1.2 Organization of the Report

This report is organized into four main sections. In Part 1, the introduction, statement of the problem, and methods of the interview study are presented. In Part 2, an in-depth review of the literature that forms the basis for my perspective is given. Both the Classical Periodization and Exercise Physiology Models are covered. In addition, some of the salient aspects of technique training are reviewed. In Part 3, the philosophies of the interviewed coaches as identified on the basis of the interviews are presented and compared with the literature. Finally, the main findings of the study are summarized in Part 4.

CHAPTER 2. THE PROBLEM STATEMENT

Generally stated, the goal of this research is to explore the philosophies of expert coaches regarding the preparation of highly qualified alpine ski racers and to discuss these philosophies against the background of the available literature. In particular, I am interested in determining which aspects of the Classical and Sport Science Models have special relevance for planning and implementation of training in the sport of alpine ski racing. Additionally, through this study I would like to gain a better understanding of the practical factors that are considered in planning.

2.1 Statement of the Problem

In accordance with the previously stated goals, the problem statement for this thesis is the following:

> *According to the experience of expert coaches, what are the important aspects on which to focus in the design of the annual plan for highly qualified alpine ski racers?*
>
> *When making decisions regarding these aspects, what factors and philosophies do expert coaches consider?*
>
> *How do the philosophies of these expert coaches compare with the literature?*

This problem statement is three-fold. The first question addresses the issue of what the important aspects to

consider in planning are. In the introduction, I described how it is important to determine the most important issues to plan and how I often felt that I had a “faulty” or “different” prioritization than the more experienced coaches. If my prioritization (which is based on my education) is wrong, then what are the most important aspects on which to focus in planning? The answer to this question then leads naturally to the second question; For the issues that are important to consider in planning, what are the philosophies and factors to which expert coaches refer when making these determinations? The final question is then how do the coaches’ philosophies compare to those supported by the literature?

2.2 Delimitation of the Problem Statement

Operationalization of Terms

A number of terms stated in the text of the problem statement deserve closer attention. First, planning training is a very broad topic in that it can range from, on the one extreme, the long-term planning of an athlete’s entire competitive career to, on the other extreme, the day-to-day planning of individual training sessions and exercises.

In this context, the creation of the so-called “annual plan” (Bompa, 1999, p. 193) plays a particularly central role. For this thesis, the term annual plan is defined as the blueprint that specifies the team’s - or individual’s - training and competition strategy, in general terms, for the duration of one competition year. It is thought that the annual plan not only provides guidelines to ensure that day-to-day planning is consistent with long-term goals (Bompa, 1999; Dreschler, 1998; Matveyev, 1977/1981) but that it also serves as an important mode of

establishing and communicating a team's philosophies and values about training (Salmela, 1996; Taylor, 1985). Moreover, I found that considerable resources in the forms of time, energy, and money are spent in the creation of the annual plan during my work at USSA. Due to this importance, I wanted to focus on the experiences and philosophies of coaches regarding the design of the annual plan specifically.

Second, I am defining a highly-qualified alpine ski racer as an athlete, male or female, who is a national team member and who is competing full-time on either a World Cup or Europa Cup / FIS team[4]. Athletes competing at this level are all in what Bloom (1985) and his colleagues defined as the third or "Later Years" of their long-term development. According to Kalinowski (1985), this phase is characterized by an extreme level of commitment on the part of the athletes and coaches to find one's limits and to "push the boundries of one's skill as far as possible..." (p. 192). Alpine ski racing for these athletes is thus a full-time commitment. I have specifically chosen a rather broad definition for highly qualified athletes because I felt that the basic philosophies of training would be rather similar for the different ages and abilities and, in cases where they were not, it would make for interesting topics for discussion.

The final term in need of clarification is that of "expert coaches." For this study, an expert coach is defined as a coach with at least ten years of experience and who is working at the national team level with highly qualified athletes as per the above definition. This definition of

[4]The International Ski Federation (FIS) sanctions competitions at a variety of competitive levels. The World Cup, a season-long series of races which takes place each year, is considered the highest level of competition. The next competitive level down from the World Cup consists of the Continental Cups, of which the European version (the Europa Cup) is considered the most competitive. Below the Continental Cup level are various national-level FIS races including national championships.

expert coaches is discussed further in the Methods chapter (See p. 24).

The Research Questions

Based on the problem statement and the goals of this thesis, a set of more specific research questions was developed to limit and guide the study (Appendix A). Some of the important strategies typically defined in an annual plan and which are of interest in this thesis include the timing and duration of on snow training camps, dryland training periods, and recovery periods; the progression in dryland training and technique training over time; and the selection of competitions.

In regard to on snow – or technical - training, I was interested in, for example, the factors that are involved in deciding when and where to have on snow training over the course of the preparation period. Also, the factors that are involved in deciding the length of an on snow training period were of interest. In addition, how on snow training is progressed, over the course of the preparation period, from the initial phases of learning a new skill to the final preparations for competition was interesting.

With conditioning training, I wanted to understand more about what kinds of conditioning were completed and when over the course of the training year. In particular, I was interested in what factors are considered in the planning of conditioning training relative to on snow training. For instance, what types of conditioning are planned for on snow training camps and why?

In addition, I wanted to focus on various aspects of planning the competition period. For instance, in the literature, the selection of competitions is considered as the basis for determining the structure of the annual plan

(Bompa, 1999; Dick, 1997; Matveyev, 1977/1981; Rahn, Wendt, Neugebauer, Feck, & Hebestreit, 1982; Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988). However, relatively little is published about how to select competitions. To my knowledge, there is nothing published in the alpine ski racing specific literature addressing this topic. This begs the question of what factors are considered in the selection of competitions. How much emphasis is given to training in the competition period? And is peaking an important aspect to consider? Philosophies of the coaches regarding conditioning in the competition period were also interesting in this regard.

A rather broad set of research questions has been defined for this thesis. In fact, separate studies could certainly have been completed looking at any one area such as on snow training, for example. However, based on my experience I feel that a weakness in both practice and the sport specific literature is in bringing all of the separate components of preparation together into a plan that builds towards the single, ultimate goal of skiing fast. To give an example, I have seen that often the on snow, technical training is planned for a year with only token consideration given to the dryland training. This plan is then passed on to the dryland coach who then has the task of planning the conditioning “around” the on snow training. Often, the result is two sets of training plans that do not work as a unit as efficiently as they could. Therefore, I wanted to study how the various aspects of physical conditioning, technique training, and competition selection relate to one another.

A couple of important aspects of athlete preparation are not addressed in this study. In particular, knowledge of the coaches regarding psychological training and personality development will not be directly investigated. However, athlete preparation is an integral process. One

cannot, for instance, separate the mental toughness training associated with hard interval training. Thus, both psychological and sociological aspects of training are discussed to a certain degree.

In studying the research questions in Appendix A, it is important to understand that my interest was not merely in getting a description of the training that coaches plan. This information by itself, although interesting, is of relatively limited use. Rather, I wanted to gain an understanding of why training is planned the way it is.

2.3 Benefits of the Study

I believe that this research is interesting for primarily two reasons. First, I have a personal interest in the problem. Because of the frustration that I experienced in my work, I wanted to gain a better understanding of the coach's perspective in planning training. If philosophies that I learned in school are not applicable in alpine ski racing, then what are the philosophies being used by expert coaches? I hope that by systematizing the experiential knowledge of some expert coaches the theory of training specific to the sport of alpine ski racing can be developed further, thus narrowing the gap between theory and practice.

Secondly, the results of this study may assist in the development of coaches' education materials. The importance of experiential knowledge in the development of elite coaches has been shown in a number of studies (Bloom, Durand-Bush, Schinke, & Salmela, 1998; Coté, Salmela, & Russell, 1995a; Coté, Salmela, Trudel, Baria, & Russell, 1995c; Gould, Giannini, Krane, & Hodge, 1990; Saury & Durand, 1998). Researchers in this area have stressed that in-depth examinations of expert coaches'

experiential knowledge are needed to enhance the development of education programs.

CHAPTER 3. METHODS

To study the problem statement, this thesis comprises two main parts. In the first, a review of the literature that forms the basis of my perspective is reviewed. In the second, in-depth interviews with expert coaches regarding their philosophies are discussed and compared with the literature.

3.1 The Literature Review

Although the primary focus of this thesis is the interview study, a few comments regarding the review of literature are appropriate. The literature presented in this study was primarily limited to texts directly addressing the problem statement and research questions. This was not an easy task; The problem statement for this study is purposefully broad and encompasses a large range of topics. Nevertheless, in selecting literature, I endeavored to remain focused on issues directly related to the design of the annual plan, e.g., how the annual plan is structured into periods of training with varying emphasis. In this regard, my goal was to review the practical recommendations given in the literature. The physiological, psychological, and motor learning bases for these recommendations are, for the most part, not included in this review.

Literature was obtained from a variety of sources. Two libraries in particular played a central role in gathering pertinent information: The library at the Norwegian University of Sport and Physical Education and the United

States Olympic Committee library at Colorado Springs. In addition, extensive searches were completed in the Sport, MedLine, and Bibsys databases as well as on the Internet.

There are several limitations of the literature review of which the reader should be aware. First, much of the literature examined here is empirically based and has not been studied using quantitative research methods (Fry, Morton, & Keast, 1992b; Hawley, Myburgh, Noakes, & Dennis, 1997; Siff & Verkhoshansky, 1996; Stone et al., 1999; Woodman, 1993). This is particularly true for the training of high performance athletes. For this reason, Fry et al. have suggested that much of the training theory literature should be considered as authoritative opinion and not as “scientific fact.”

A second point to bear in mind is that a substantial portion of the literature related to this thesis was originally published in Russian and German. This literature is important as many of the theories we use today in the planning of training originated in the former Soviet Union and East Germany (Freeman, 1989; Siff & Verkhoshansky, 1996; Verhoshansky, 1999). The German literature is perhaps particularly important as German authors have had access to both Soviet information and the sport science research of Western countries (Major, 1981b). Unfortunately however, this literature is inaccessible to me due to my limited language skills. To counter this, I have purposefully sought out English translations.

In addition, a review of the literature in this field is made difficult due to a tradition of providing incomplete reference information. For instance, much of the literature from the former Soviet Union and East Germany cites only the author’s last name and publication year. Additionally, coaching publications often do not list

reference information. As a result, it is difficult to trace philosophies as they develop in the literature.

Finally, the translation of names from the Cyrillic to the Roman alphabet results in some authors' names being spelled differently depending on the translator. At times, it is difficult to tell for sure if it is even the same author. In this thesis, when citing a specific article I have used the translator's spelling of the author's name; When referring to the author in a general context, I have used the spelling that I have found to be the most common.

3.2 The Interview Study

Selection of the Interview Method

Due to the explorative nature of this study's research problem, the in-depth, unstructured interview method as described by Kvale (1996) was selected. In particular, there are three reasons for this decision.

First, based on my work experience, I believe that ski coaches have a lot to offer in knowledge of what is important in the planning of training. Furthermore, I have found that much of this knowledge is not described in the training theory literature, at least not applied to alpine ski racing. A number of authors have made this observation and have suggested that qualitative approaches such as the in-depth interview method be used to access this knowledge (Coté et al., 1995c; Gould et al., 1990; Martens, 1987; Salmela & Russell, 1994).

Second, as my perspective is based more on the literature than experience, I felt that it was important for me to be as open as possible to input from coaches which was likely to come from unexpected directions. This openness to the

research subjects is one of the strengths of the unstructured interview method.

Last, training theory is a fairly complex topic with an often confusing and contradictory vocabulary. Use of the face-to-face interview situation would allow the coach and myself the opportunity to clarify us when using potentially confusing terms. This was especially important for this project as English was a second language for a majority of the subjects.

Definition of the Sample

Theoretical sampling was used in the selection of coaches to interview. According to Mason (1996), the logic of theoretical sampling is to select subjects from which the most can be learned about the research questions. It is important to have a strategic purpose in defining the selection of subjects when using theoretical sampling. For this study, this included clarifying such issues as the sample size, the level of expertise of the coaches, the geographical dimensions of the sample, the administrative dimensions of the sample, and the philosophical dimensions of the sample.

The Sample Size

A common criterion used in the qualitative research literature to determine the sample size is theoretical saturation. According to Strauss and Corbin (1998a) this means sampling until the point at which “no new properties, dimensions, or relationships emerge during the analysis” (p. 143). At the same time, however, practical limitations as to how much information can actually be handled in a reasonable manner need to be taken into consideration. Kvale (1996) suggests that 1000 pages of interview transcripts, or around 35 hours of interview recordings, is the limit of what can be realistically kept

under control in an analysis. He suggests further that this probably consists of 15 ± 10 subjects.

In this study, 14 coaches were interviewed yielding around 25 hours of interview recordings and just over 500 pages of transcripts. Due to limited time and financial resources, this was the extent of what could be accomplished. However, it should be noted that theoretical saturation, according to the definition of Strauss and Corbin (1998a), was not reached for some topics. In this regard, there are certain “holes” in the data which are identified in the results and which will need to be followed up in greater detail in future research.

The Level of Expertise

The definition of expert coaches used for this study was based on two criteria. First, coaches were to have at least 10 years of full-time coaching experience. Thirteen of the fourteen coaches selected to the sample met this qualification. Second, the coaches were to be currently coaching at the national team level. I saw the employment of a coach by a national federation as peer recognition of the coach’s expertise. All of the selected coaches were either currently coaching at the national team level or were very recently retired from coaching at the national team level (i.e., within one year) at the time of the study. The average length of time this group of coaches had been working at the national team level was 8 years (range = 3 to 14 years). This definition of expertise is consistent with that used in previous studies of the knowledge of expert coaches (Coté, Salmela, & Russell, 1995b; Coté et al., 1995c; Gould et al., 1990; Leas & Chi, 1993; Salmela, 1995; Salmela, 1996; Salmela & Russell, 1994; Saury & Durand, 1998).

Access to coaches was primarily obtained through a series of informal contacts. In this regard, I knew many of the coaches who were interviewed from my previous work. Thus, those coaches who were included in the sample was first and foremost limited by the extent of my personal contacts and the availability of these coaches. All of the selected coaches were males.

Geographical Dimensions

Coaches from the United States, Scandinavia and central Europe were asked to participate in the study. A distribution of the coaches' nationalities is presented in Figure 3.1. The primary goal in including coaches from various countries in the sample was not to differentiate the practices of different nations, although this was interesting, but rather to gain a wider perspective and insight into the issues considered important in the planning process. As Freeman (1995) noted, "too often our range of knowledge of our field's theory and practice seems to go little beyond our own nation" (p. 22). The six countries included in this study - Austria, Switzerland, the United States, Sweden, Norway, and Slovenia - were specifically selected due to the high level of international success obtained by their respective athletes.

Administrative Dimensions

At the national team level in alpine ski racing, three types of coaches can be identified based on their responsibilities in the planning and implementation of training. These are head coaches, ski (technique) coaches, and dryland (conditioning) coaches. Because all three types of coaches are usually involved in the planning process, and because they usually have different perspectives in this planning, all three types were

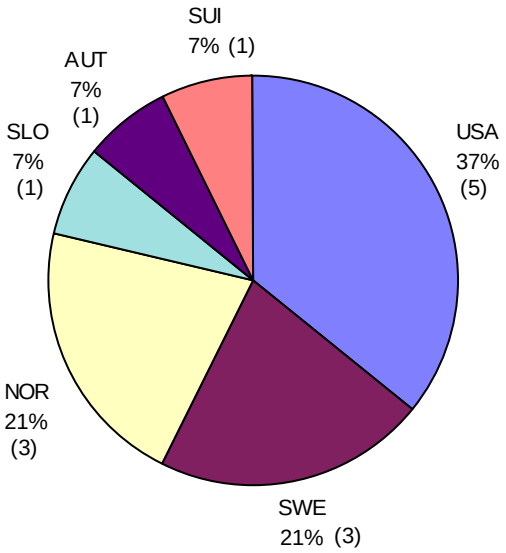

Figure 3.1. The distribution of the sample by nationality. The numbers indicate the percentage of the total sample followed by the number of subjects in parentheses.

included in the sample. It should be noted that many of the coaches have had varying responsibilities throughout their careers. For instance, at least five of the fourteen coaches had worked in at least two of the three aforementioned roles previously. Therefore, it would be misleading to merely report the coaches' positions at the time of the interview. Instead, the total years of experience for each coach in each position at the national team level was summarized (Figure 3.2).

Philosophical Dimensions

When possible, coaches with somewhat differing philosophies were invited to participate in the study in order to gain a broader perspective on the issues to be discussed. I primarily made this decision based on what I knew of the coach's philosophies and background.

Completion of the Interviews

As this project involved my first experience with interviewing, it was important for me to practice prior to the formal data collection. Therefore, a pilot study of four interviews was conducted. Selected coaches, initially from Norway and then from the United States, were interviewed for training. A preliminary analysis of the pilot interviews helped with finalizing the study's problem statement and research questions; the organization of the interview; and the design of the interview guide.

Formal interviews took place in the time periods of July 15th to August 20th, 1998 and September 15th to November 15th, 1998 in the United States and Norway, respectively. Contact with a coach usually began with a conversation in which the study was briefly described. If the coach was interested, an interview appointment was made. Provided there was enough time before the interview was to take

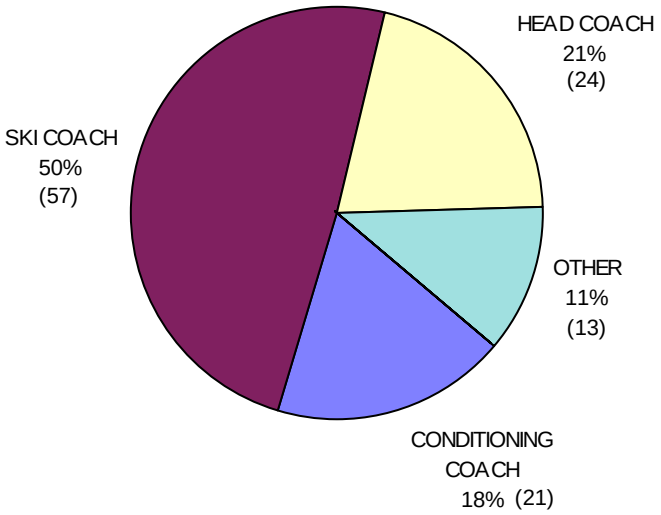

Figure 3.2. The distribution of the sample's years of experience at the national team level by coach type. The numbers indicate the percentage of the sample's total years of experience followed by the number of years of experience in parentheses. The category "OTHER" consists of the positions of team director, sport science, director of development, and coaches education.

place, a brief description of the study and a copy of the informed consent form was given to the coach so that they could understand the study better and prepare their thoughts.

The interviews took place at such a time and location as to be most convenient for the coaches. At the same time, locations free of distractions and noise were selected. Interview locations included coaches' homes (4 interviews), ski federation offices (6 interviews), a coach's office (1 interview), a school conference room (1 interview), a hotel room (1 interview), and a hotel conference room (1 interview). Each interview consisted of one to two sessions ranging in duration from 60 to 180 minutes per session.

An interview guide (Appendix B) that was developed based primarily on the research questions (Appendix A) and the experience gained in the pilot study was used to direct the interview. In order to gain as much insight as possible into each individual coach's expertise, I geared the interviews to match each coach's background. This meant that not all topics were discussed with every coach. Instead, before each interview, I went through the interview guide, highlighting the various topics that I anticipated to be discussed based on what I knew about the coach's experience. Generally speaking, on snow training issues were discussed with ski and head coaches, dryland training issues were discussed with conditioning coaches, and general issues were discussed with head coaches.

By way of introduction, each interview began with a description of the purpose of the research as well as how the interview would be used in the study. In addition, the coaches were informed of the risks and benefits with

participation in the study and an informed consent form (Appendix C) was signed.

Typically, the first topic to be discussed in the interviews was the coach's background. I found it to work well to "break the ice" with easy questions regarding the coach's experience and qualifications and then gradually to "warm-up" to the real "heart" of the interview. Thereafter, the interview took the form of a "conversation with a purpose" (Mason, 1996, p. 43) in which I would hold the discussion to the themes which I wished to discuss as indicated in the interview guide. At the same time, I endeavored to remain open to what the coach felt was important based on their experience.

Data Analysis

Grounded theory as described by Tesch (1995) and Strauss & Corbin (1998a) was used as the theoretical basis for the analysis of the interview data. In grounded theory, an inductive methodology, the researcher's focus is on the unearthing of regularities in the interviews. Rather than testing or trying to prove existing theories, the goal is the development of concepts and theories that account for the behaviors of the individuals under study (Coté et al., 1995c). This fit well with the explorative nature of this study's problem statement. In describing this particular type of analysis, Tesch identified the following two processes as being involved: "de-contextualization" and "re-contextualization" (p. 115).

De-contextualization

De-contextualization entails the identification of relevant and meaningful quotes and their separation from the context of the interview transcripts. These quotes, termed "meaning units" by Tesch (1995, p. 116), are segments of interview transcripts that are comprehensible

by themselves and contain a single idea, episode, or piece of information. In grounded theory, meaning units serve as the basic unit of the analysis.

For this study, the process of de-contextualization consisted of three progressive steps: (1) the recording and transcription of the interviews, (2) the initial indexing of the interviews, and (3) the definition of the individual meaning units.

First, each interview was recorded in its entirety onto high quality audiotapes. On one of the first interviews, there was a tape recorder malfunction and the subject was interviewed a second time at a later date. After this malfunction, all interviews were simultaneously recorded using two tape recorders to ensure that back-up tapes were created.

After each of the two formal interview periods, the audio recordings were transcribed using a word processor (Microsoft Word). Once initially transcribed I listened to each interview a second time in order to correct any errors in the transcripts and to improve my familiarity with the data. As transcriptions were to be used more as a description of a process in which coaches are involved, and not to interpret a deeper meaning from what the coaches said, the interviews were transcribed into a more formal, written style instead of verbatim (Kvale, 1996). This meant, for instance, that emphasis in intonation and emotional expressions like laughter were left out of the transcriptions. Additionally, any portions of the interviews where little relevant information to the study were exchanged were condensed and summarized.

In all, 500 pages of interview transcripts were generated. The hard copies of these transcripts were organized in such a manner that text segments could be readily located

by knowing the subject id number, audio tape number, tape side, and start and end line numbers. The interview transcripts were the primary source of data for this study. In addition, the interviewer's notes, memories and interpretations as well as any figures and / or texts generated during the interviews, or given by the coaches, was considered data.

Second, the interview transcripts were indexed so that a systematic overview of the data could be obtained as well as allowing for the retrieval of specific issues and topics which did not appear in a sequential manner in the transcripts (Mason, 1996). At first, a very general set of initial categories and their definitions was created. These can best be thought of as a relatively broad set of themes covered in the interviews. This initial index was created based on a review of the literature, the research questions, and preliminary analysis of the first interviews. In this process, the interview transcripts were re-read and the various themes in the index were located in the texts according to the subject id, audio cassette number and side, and line numbers. These locations were then saved in a database (Microsoft Access) which allowed me to quickly look up portions of the interviews according to the theme discussed.

Last, after the initial indexing of the interviews was completed, each index category was axially studied and meaning units were defined. A total of 1,700 meaning units were created and copied from the interview transcripts to the database where they were stored under their respective index category.

Re-contextualization

Re-contextualization involves comparing meaning units and grouping those with similar characteristics together. In

this manner, a categorization system is inductively created on the basis of the meaning units. In this study, the first step in re-contextualization was to print out all of the meaning units onto index cards and group them according to their general index category. By having the meaning units on index cards I was able to manually begin re-organizing the cards into a system which was both partly based on the original index and partly based on my evolving interpretations of the data. This means that I both broke down old categories from the initial index and inductively created new categories from the meaning units. In this manner, the meaning units were re-contextualized into categories. The interpretation of the meaning units and subsequent modification of the classification scheme continued throughout the writing of the report.

A goal of mine during the data analysis was to create a categorization system that not only adequately presented my interpretations of the interviews but also did so in a manner that would be useful to coaches in practice. While buried deep in the frustrations of the data analysis, I read an article by Carl (1992) in which he refers to “decision categories” and “decision variables” (p. 228) in relation to planning. A light went on in my head and I began to see the interview data in terms of aspects of the annual plan about which a coach must make choices (decision categories) and the factors and philosophies that coaches consider when making these choices (decision variables).

In the end, the organizing system had evolved into a five-tiered categorization scheme that serves as the basis for the results of the study. At the highest level of the categorization system, I have defined nine classes of decision categories, each of which represents an aspect of the annual plan that coaches consider when planning. For instance, one class is the planning of on snow training

within the preparation period. Within each class are defined between one and four decision categories. As an example, one such decision category for the planning of on snow training is the structure of on snow training. Within a decision category, sub decision categories may be defined. An example of a sub decision category for the structure of on snow training is the distribution of on snow training. A diagram of all the classes, decision categories and sub decision categories is presented in Appendix D. Classes, decision categories, and sub decision categories represent the aspects of the annual plan that are important to consider in planning as identified on the basis of the interviews.

For any decision category or sub decision category a number of decision variables may be defined. For instance, one variable that coaches consider when planning the distribution of on snow training is the time of year and the quality of training opportunity. The final, deepest level of the categorization scheme consists of the dimensions of a decision variable. One such dimension in connection with the time of year and the quality of training opportunity is taking advantage of the good training opportunity in the Spring. Decision variables and dimensions of decision variables represent the philosophies of the interviewed coaches in regards to the identified classes, decision categories and sub decision categories.

An example of a meaning unit and how it was categorized is presented in Figure 3.3. The meaning unit was first grouped under “acclimatization to altitude,” which was later grouped as a dimension for the decision variable of “altitude.” Altitude, in turn, was a decision variable for the sub decision category ”the distribution of on snow training” which was grouped under the decision category of “the structure of on snow training.” This decision

category was then grouped in the class of “the planning of on snow training in the preparation period.”

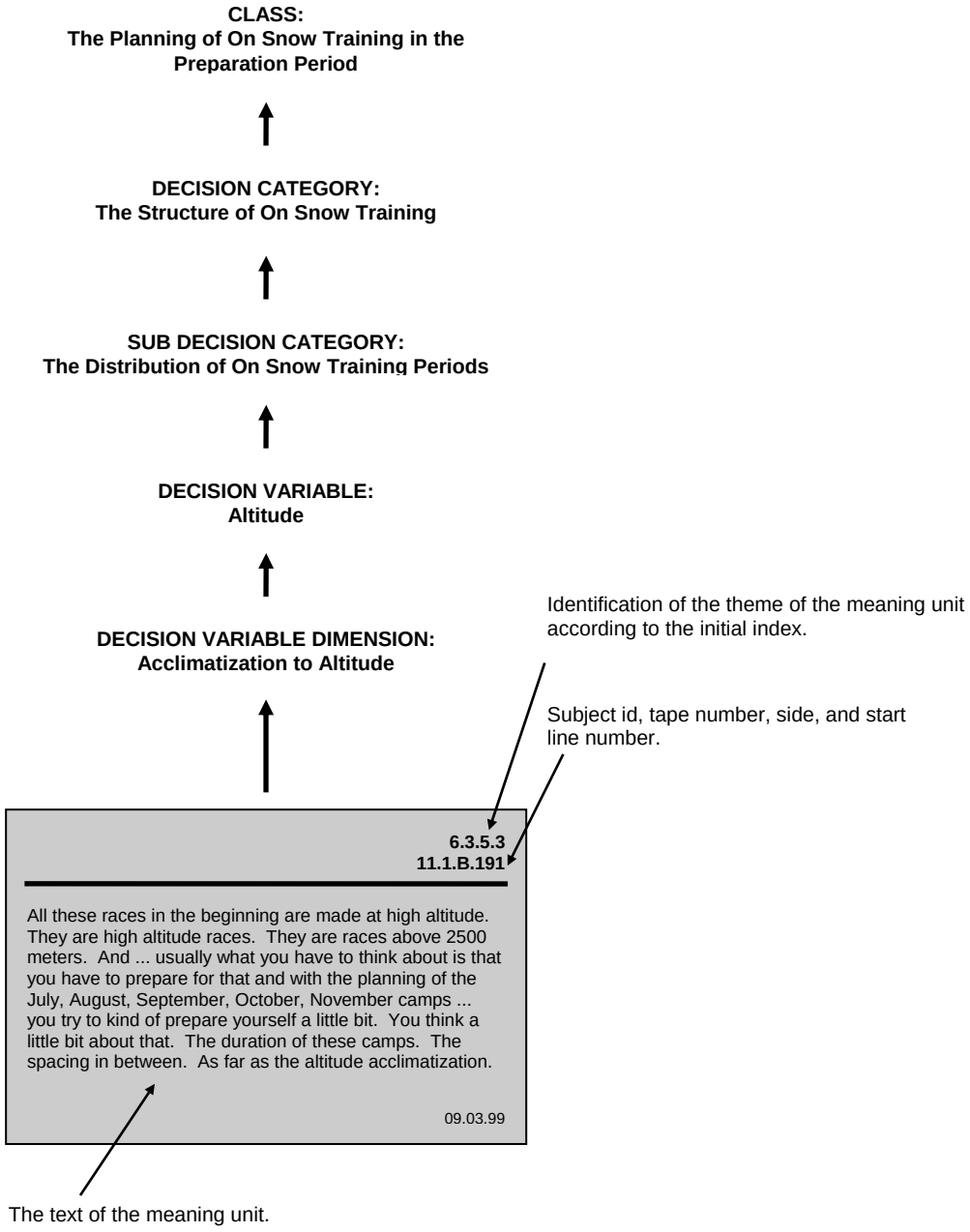

Figure 3.3. An example of a meaning unit and how it was categorized during the data analysis.

Steps Taken to Ensure the Quality of the Study

There is currently debate about the concepts of validity and reliability in the qualitative research literature. For instance, some authors offer a set of rather rigid

rules about certain qualifications a research design needs to meet in order to be valid and reliable. At the same time, other researchers seriously question the appropriateness of these concepts for qualitative inquiry and suggest that other measures of the "quality" of a study need to be defined (A. Sparkes, personal communication, May, 1998). I have taken several steps to help ensure the quality of this study.

First, as described previously, the sample was purposefully selected. As Mason (1996) suggests, "finding a successful answer to the question of what you should sample contributes to the ultimate production of analytical validity by ensuring that you are looking in the right places when you go about the process of data generation" (p. 90). As a part of this selection, coaches who were known to have varying training philosophies, including coaches from various countries, were included in the study.

In addition, my personal opinions and background are evaluated and presented. It is hoped that by better understanding my background, the reader will be in a better position to understand how I came forth to my interpretations (Fontana & Fry, 1994; Kvale, 1996).

Furthermore, copies of the transcripts were mailed out to the interviewed coaches for their review. The coaches were given approximately two months to review the transcripts and advise me of any changes, problems, or additional comments that they had. Although a very low

number of coaches responded (3 of the 14), the comments that the responding coaches did have were very minor and essentially amounted to confirming what they had said in the interviews.

In addition to mailing out the transcripts for review, one coach in the original sample was re-visited to discuss the initial results. The main goal during this meeting was to determine if the re-contextualized categories of meaning units were meaningful to the coach and if they corresponded to how he experienced planning.

As a final measure, I have tried to present my methods of data analysis for the reader, including an example of how I categorized meaning units (See Figure 3.3). It is hoped that from a detailed description of the data analysis that the reader will be able to understand how I came about to the categorization scheme.

Speaking from the post-modernistic side, I think that the "quality" of this research should be evaluated according to its original goal - to describe some of the principles and philosophies that expert coaches use in the planning of training for highly qualified alpine ski racers. Put another way, when one evaluates the quality of this study, one should ask, "Does this work provide useful and interesting information to coaches and does it stimulate self-reflection into how one plans training?"

Potential Limiting Factors

There are several potential, limiting factors to this study. First, in a short, two-hour interview session, not all aspects of a complex subject such as the training of elite athletes can be discussed. Therefore, it cannot be claimed that this study describes all of the important aspects of planning of training for elite alpine ski racers. It cannot even be claimed that the most important

aspects have been covered as the degree of importance of a factor can only be determined by the specifics of the situation in which a coach is planning. To the contrary, this study can only claim to have examined some of the important aspects of training according to the experience of the fourteen interviewed coaches. The degree to which the results of this study apply to one's own situation will have to be determined by the reader. In qualitative research methods literature, this is termed "reader generalization" (Kvale, 1996, p. 234).

A second limiting factor is my relatively limited experience in coaching. A good deal of the interview analysis process consisted of finding what I understood to be important aspects of planning training in the large collection of interview transcripts and then categorizing these into a system suitable for presentation. Due to my lack of experience, I have relatively little practical knowledge on which to base such decisions. Another researcher with more experience at coaching may have picked other quotes and created a different categorization system. On the other hand, however, my relative lack of experience may have left me more open to differing opinions and philosophies. This could have allowed me to discover certain topics in the interviews that I might have otherwise subconsciously dismissed had I been more experienced just because I disagreed with it.

Another potential limitation of the study could be the result of language difficulties. All of the formal interviews were conducted in English. Although almost all of the coaches spoke English extremely well, those coaches for whom English is a second language - 64% of the sample - may not have been able to express their thoughts as effectively as they could have in their native tongue. An advantage of using the in-depth interview method, however,

is that the coaches had the opportunity to clarify themselves on points that they may have felt were unclear.

Last, I knew some of the coaches quite well having worked with them previously in the planning of training. In these cases, certain questions may not have been asked and some information assumed, thus tainting the content of the interview (Saury & Durand, 1998). In this regard, I tried to be critical about my own presumptions when entering each interview situation; In the words of Kvale (1996), I tried to be “deliberately naive” (p. 33).

Ethical Issues

There are two particularly important ethical issues with this study, namely confidentiality and informed consent. In regards to the former, it is the researcher’s responsibility to ensure that every measure is taken to protect the anonymity of the subjects. Several steps were taken with this purpose. First, the names of the coaches being interviewed were not discussed outside of the researcher, the student advisor, and any necessary contacts that were deemed necessary in gaining access to a particular subject. Additionally, all subjects were assigned an id number that was used instead of the subject’s name in all written references to the subjects (e.g., on tapes, in transcriptions, on files, etc.). Furthermore, only the researcher and the student advisor had access to the taped interviews during the study. At the completion of the study, these tapes were destroyed. Only the researcher, student advisor, and the subject had access to the transcribed interviews. As a final measure, all references to the subjects in the text of the report were changed. Although I felt that additional information would help the reader in interpretation, quotes used as examples in the final report are not accompanied by any subject information. The world of alpine ski racing is

relatively small and I felt that any personal information regarding the coaches would very likely break confidentiality.

The second ethical issue in this study is that of informed consent. With in-depth interviewing, there are some problems with gaining informed consent prior to the interview (For a discussion, see Mason, 1996). Despite these issues, all subjects were asked to sign an informed consent form prior to each interview. This form stated the goals of the project, the risks and benefits with participation, how ultimately the interviews would be used, that the subject's participation was voluntary, and that they had the right to withdraw from the study at any time (see Appendix A).

PART 2. MY PERSPECTIVE: A REVIEW OF THE LITERATURE

In this part of the thesis, the theoretical foundation forming my perspective is reviewed. In Chapter 3, aspects of the Classical Periodization Model that are important to consider in creating the annual plan are discussed. The Exercise Physiology Model is reviewed in Chapter 4. In Chapter 5, some issues of technique training are presented.

CHAPTER 4. THE CLASSICAL PERIODIZATION MODEL

4.1 The Development of the Classical Periodization Model

Contrary to what may be popular belief, systematic physical training is not new and has in fact probably been around for hundreds, if not thousands of years. Although difficult to trace, concepts behind the current models of planning may have originated as long ago as ancient Greece (Bompa, 1999; Dreschler, 1998; Pedemonte, 1986a; Siff & Verkhoshansky, 1996).

It is thought that the foundations for modern planning were laid in the former Soviet Union at about the time of the Russian Revolution (1917) (Siff & Verkhoshansky, 1996). However, it was not until after the Second World War that the concepts behind the Classical Model of periodization began to crystallize and appear in print. During the 1950's and 1960's, Matveyev, who is widely considered the leading theorist of the Classical Periodization Model, studied the training and competition results of Soviet athletes and then published his theories in his 1964 book, The Problem of Periodization in Sports Training (Matveev, 1964), and again in his 1977 book, Fundamentals of Sports Training (Matveyev, 1977/1981). These works attracted the attention of the world due to the outstanding performances achieved by Soviet athletes in international competition at that time (Verhoshansky, 1999). It is worthy to note, however, that similar

philosophies were being developed at the same time in New Zealand by Arthur Lydiard in the sport of running (Hawley, 2000).

Matveyev's work was first translated and used widely in East Germany, led by Harre (Freeman, 1989). In the West, however, there were very limited references to Matveyev's philosophies before the publication of Dick's overview in 1980 (Dick, 1980). Then, beginning in the early 1980's, Matveyev's 1977 book, and shortly thereafter Harre's book, Principles of Sports Training (1982a), were translated into English. Since then, the Classical Model has received much attention in the Western literature. Indeed, as Verhoshansky (1999) suggests, the Classical Model has – inappropriately, I might add - become a synonym for the "planning of training" in many Western countries.

Following in this chapter is a description of the Classical Periodization Model as described in the literature. The first section presents the "principles" of training which form the foundation of the Classical Model and which have important application in the design of the annual plan. In the second section of this chapter, the structure of the annual plan according the Classical Model is presented. Finally, the criticism of the Classical Model is reviewed.

4.2 The Principles of Training

At the heart of the Classical Periodization Model are a number of principles used in the planning and implementation of training. Following is a brief presentation of the most central principles found in the literature. Particular attention is paid to the implications that these principles have for the design of the annual plan.

The Principle of Load Progression

The term “training load” is used in the literature to describe the sum of the training demands placed on an athlete (Sands, 1992). The Principle of Load Progression states that training loads of a constant nature provide less and less stimulus for an athlete as he or she adapts to the training and becomes fitter. Consequently, an increase in the training load is necessary if the athlete hopes to reach new levels of performance (Berger, Harre, & Ritter, 1982; Dick, 1997; Freeman, 1989; Freeman, 1995; Fry et al., 1992b; Hawley, 2000; Kirksy & Stone, 1998; Maglischo, 1993; Matveyev, 1977/1981; McInnis, 1981; Viru, 1993a). This places an extreme demand on the creativity of a coach who is working with high level athletes for an extended period. In an interview by Hoffman (1999), Mark Verstegen[5] explained this difficulty in the following manner: ”The body adapts so rapidly that we have to continually change and find new ways to challenge [our athletes]. When you work for an athlete for a long time, how do you push his or her envelope further and further? That is where the challenge comes in” (p. 74).

There are many ways in which the training load can progress. According to the Classical Model, the most typical progressions over the course of a training year include increased training volume, increased training intensity, and increased specificity of the training methods.

The Principle of Feasibility

The Principle of Feasibility refers to the idea that although the training load must progress, the athlete should be presented with a training regimen that is realistic in terms of both volume and content (Berger et

[5] Director of the International Performance Institute in Bradenton, Florida.

al., 1982; Freeman, 1996). In other words, while a training load that is too low will not adequately stimulate the athlete to improve, a training load that is too high will also result in less than optimum results. Freeman (1996) aptly pointed out that “the [training] demand should never be beyond the reasonable capability of the athlete, or it will become psychologically (and perhaps physically) destructive to the athlete’s progress ... The object of training is improvement, not discouragement or defeat” (p. 14). A practical consequence of this principle is that while training must be progressed, it should be progressed at a gradual enough rate that the athlete can master the training.

The Principle of Moderation

Related to the Principle of Feasibility is what some authors have referred to as the Principle of Moderation (Dreschler, 1998). This principle states that while sport must come first, every athlete should develop a balanced approach to life (Bowerman & Freeman, 1991; Dreschler, 1998). An athlete whose training consumes all aspects of his life is likely to experience a breakdown at some point. In the process he will lose valuable training time and perhaps even end his career. Consequently, the amount of time available to the sport is limited by the athlete’s energy level, his ability to recover, and the other needs in his life.

The Principle of Continuous Load Demand

The Principle of Continuous Load Demand states that long interruptions in the training process should be avoided (Berger et al., 1982; Bowerman & Freeman, 1991; Freeman, 1989; Matveyev, 1977/1981). When an athlete reduces the amount of his training, or ceases training, training adaptations plateau and eventually decay. Some authors

have referred to this phenomenon as the Principle of Reversibility (Dick, 1976; Hawley, 2000; Holmes, 1999; Lange, 1999). Functional, sport-specific capacities are probably susceptible to rapid detraining in particular (Wilmore & Costill, 1988).

One obvious implication of the Principle of Continuous Load Demand for the annual plan is that long periods of low training volume should be avoided to minimize the effects of detraining. At the same time however, a second implication is that periodic recovery periods should be incorporated into the annual to avoid excessive strain that could later result in training being restricted for a prolonged period (Berger et al., 1982).

The Principle of the Wave-Like Fluctuability of the Load

In Matveyev's research on the training of Soviet athletes, he found periodic waves in the training load over the course of the year. Mikhailov (1988) suggested that there are essentially two types of these waves based on their causes. The first type of wave is unavoidable; They result from drops in the training load due to such problems as injuries and illnesses.

The second type of wave, on the other hand, is included as a planned measure. In fact, according to proponents of this principle, training would be less effective without them. The main reason suggested for the inclusion of waves in the training load are the cycles between training and recovery (Bjørn, 1984). The training load progressively builds to a brief peak that often exceeds the athlete's capabilities at that point. However, this peak in training load is immediately followed by a period of recovery in which the athlete is allowed to regenerate both physically and psychologically.

The benefit of a wave-like structure to the training load is two-fold. First, it has been suggested that structured recovery periods enhance the effectiveness of training (Bompa, 1994; Calder, 1992; Dick, 1987; Fry et al., 1992b; Maglischo, 1993; Matveyev, 1977/1981; Mikhailov & Minchenko, 1988; Siff & Verkhoshansky, 1996). The recovery periods provide both physical and psychological rest as well as time for adaptation to occur so that the following period of training can be performed at a higher level of effort.

Secondly, it has been suggested that periodic recovery can help prevent injury and overtraining (Banister, Carter, & Zarkadas, 1999; Bruin, Kuipers, Keizer, & Vander Vusse, 1994; Calder, 1992; Dick, 1987; Fry, Morton, & Keast, 1992a; Homenkova, 1997; Kipke, 1987; Kraemer & Nindl, 1998; Lehmann et al., 1998; Matveyev, 1977/1981; O'Toole, 1998; Rowbottom, Keast, & Morton, 1998). Monotony in the overall training load – i.e., a constant training load over an extended time period - has been associated with the development of the overtraining syndrome (Lehmann et al., 1998).

In considering waves in the overall training load, it is also important to be aware of stresses from outside the training environment. High occupational, educational, or social stresses may mean that training loads should be scaled down (Dick, 1987; Lehmann et al., 1998; O'Toole, 1998; Rowbottom et al., 1998).

The Principle of Specificity

In the training theory literature, training methods are often rated according to their “specificity” to the actual competitive action. According to Verkhoshansky (1985/1988), specificity refers to the degree of conformity to the competition activity with respect to (1)

the motor structure, (2) the regime of work, and (3) the mechanism of energy acquisition. Generally, three classifications of training are identified according to their degree of specificity.

General preparation (GP) is that training which "... does not boil down to the selected sport for specialization, but expands the prerequisites for successful engaging in the selected sport and promotes perfectioning in it on the basis of the comprehensive development of the athlete" (Matveyev, 1977/1981, p. 30). It implies an all-around program which focuses on the establishment of a certain minimum status in the foundations of fitness for the specific sport (Dick, 1975).

Special preparation (SP), on the other hand, is training specific to the competitive activity of the sport. It includes technique training as well as the training of physical capacities and psychological skills that are specific to the demands of the sport in question (Matveyev, 1977/1981).

Competition specific preparation (CSP) includes training where all aspects of the athlete's preparation are rehearsed in a competitive situation (Dick, 1975). This type of training can range from a high level of SP to actual competition.

The Principle of Specificity states that the body adapts very precisely to the type of training that is completed (Dick, 1997; Freeman, 1989; Hawley, 2000; Kibler & Chandler, 1994; Kirksy & Stone, 1998; McInnis, 1981; O'Shea, 1990). As Verhoshansky's definition of specificity implies, this is not just in terms of which muscles are used. Training is also specific according to the primary energy systems used; the amount of force developed; and the speed, frequency, and range of movement

required (Dick, 1976). Essentially, training must be specific to the desired result.

The Principle of Multi-Lateral Development

The Principle of Multi-Lateral Development maintains that although training must ensure a maximum degree of specialization of the athlete in the chosen sport, the highest performance level which can be reached is ultimately limited by the athlete's many-sided, or general, development (Matveyev, 1977/1981; O'Shea, 1990). Adherence to this principle gives rise to two characteristics of the annual plan which are often associated with the Classical Periodization Model.

The Relationship between General and Special Preparation

According to the Principle of Multi-Lateral Development, the first portion of training should be focused on developing the general fitness of the athlete. Hence, the ratio of GP to SP is typically high at the start of training. Over the course of the training year, the proportion of SP increases and finally reaches its highest point at about the time of the first competitions (Dreschler, 1998; Major, 1981a; Viru, 1995). During the competition season, the ratio of GP to SP remains low; Only a small amount of GP is included in training to enhance physical and psychological recovery (Berger et al., 1982; Bompa, 1999; Calder, 1992; Dick, 1975).

This progression from GP to SP is thought to be one of the primary reasons for the success of the Classical Model. The prolonged period of GP at the beginning of training prepares the athlete to better tolerate the higher intensity, sport-specific loads to come later in the year (Bompa, 1999; Tan, 1999). Additionally, it provides a base for more consistent performance during the competition period (Berger et al., 1982; Bompa, 1999).

Charniga et al. (1986a) have suggested that such a progression may also help in the prevention of overtraining. Finally, changing between GP and SP brings a degree of variety into the training program and thereby decreases the likelihood of boredom (See the Principle of Variety, p. 54).

There may, however, be much more to the relationship between GP and SP than just the fact that one comes before the other over the course of the training year. Major (1981a) and Aamodt (1996) have suggested that the relationship between GP and SP should be used in a much more dynamic way. For instance, according to Aamodt (1996) much of the foundation fitness detrains and technique begins to fail as a result of high volumes of SP and CSP and low volumes of GP during the competitive season. This, in turn, results in decreased performance towards the end of a long season. They suggest that by including regular periods of GP, the foundations of fitness can be maintained and this drop in performance prevented. Moreover, it is thought that by varying the training load, GP can help the athlete to rest better from the specialized event and help to restore the functional capabilities of the central nervous system (Calder, 1992). As a result of maintaining the foundations of fitness as well as enhancing recovery, GP may help an athlete to perform at a higher level over a longer time frame during the competition period.

In addition to changing over the course of the training year, it is also thought that the relationship of GP and SP should evolve over the course of an athlete’s career, with SP playing an increasingly important role (Bompa, 1999; Matveyev, 1977/1981; Matveyev, 1992; Matveyev, 1994). Moreover, Matveyev (1977/1981) maintains that the contents of GP should become more specialized as the athlete progresses.

The Inverse Relationship between Volume and Intensity

Perhaps one of the most commonly cited characteristics of the Classical Periodization Model is the relationship between training volume and intensity (Berger et al., 1982; Bjørn, 1984; Bompa, 1999; Kirksy & Stone, 1998; Maglischo, 1993; Sands, 1992; Siff & Verkhoshansky, 1996; Stone et al., 1999; Tan, 1999; Viru, 1990; Viru, 1995). As a consequence of the changing ratio of GP and SP over the course of the annual plan – and thus ultimately as a consequence of the Principles of Specialization and Multi-Lateral Development - the relationship between training volume and intensity takes on a special pattern (Figure 4.1). Due to the primary focus on GP means during the first half of the preparation period, there is usually a large volume and low intensity of training at that time. Then, as the training begins to become more and more specialized, the training volume gradually peaks and then begins to drop. At the same time the training intensity begins to rise. Finally, maximum intensity is planned for just prior to the main competitions of the season.

The Principle of Variety

Perhaps one of the most important principles of the Classical Model is known as the Principle of Variety, which states that when possible one should include variety in training. Generally speaking, there are two main reasons for this importance given in the literature.

Variety Improves the Effectiveness of Training

First, it is thought that variety can increase the effectiveness of training. This can be seen from psychological, physiological, and technical viewpoints.

From the psychological point of view, one of the most common reasons for athletes to cease to make progress is

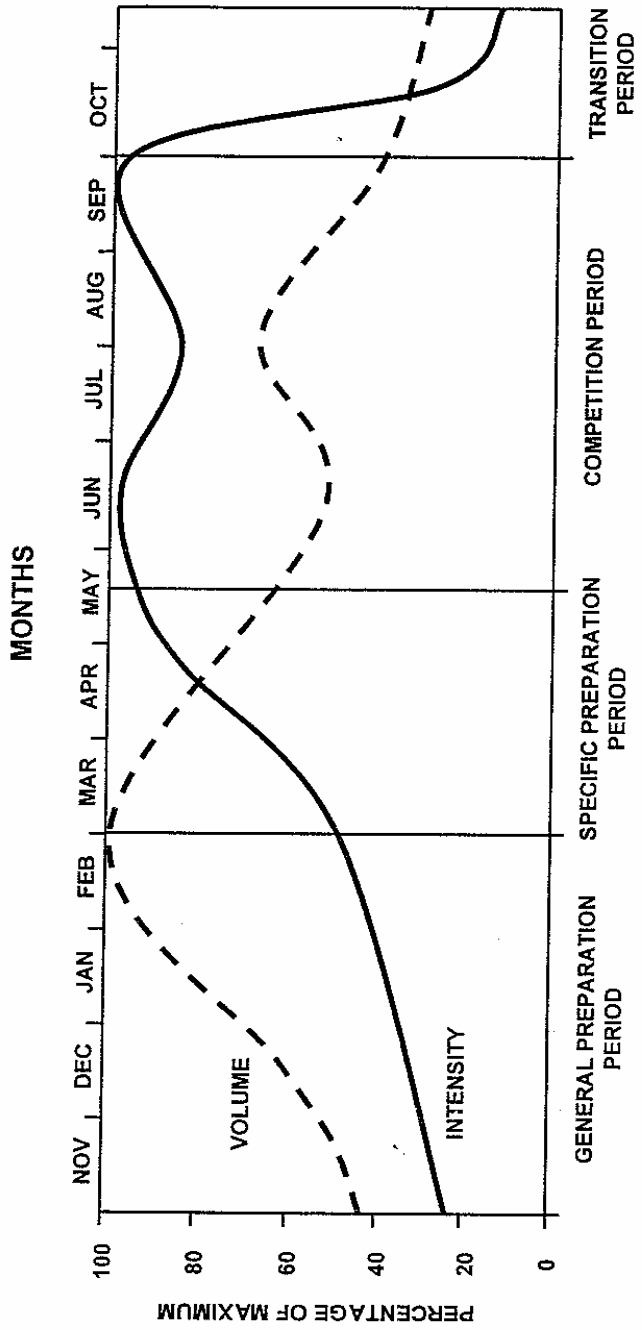

Figure 4.1 The inverse relationship between volume and intensity over the course of the annual plan. Modified from Matveyev and Giljatsova (1991).

when the training regime has become monotonous and appears to serve little or no purpose to the athlete. By creating variety in the training regime one can help to improve motivation and maintain a positive approach to training (Bowerman & Freeman, 1991; Freeman, 1989; Homenkova, 1997; Kibler & Chandler, 1994; Lange, 1999; Lester, 1993).

From the physiological viewpoint, variety improves the quality of training by fighting stagnation. According to Plekhov (1991b), “As time passes, the response of the body to a specific load fades away. Having mastered and become accustomed to the load, the athlete’s body seems to lack the stimulus for further improvement and stagnation sets in” (p. 148). In this connection, variety can be used to create “extreme” conditions to which the body must quickly adapt itself (Plekhov, 1991b). This is related to the Principle of Load Progression discussed earlier; The systematic inclusion of a variety of training methods with a gradually increasing load is the key to improved performance.

From the technical point of view, variety is critical for sports in which there is a large diversity of competition conditions to which technique must be adapted. This is particularly important for open sports such as alpine ski racing. In such cases, a sufficient degree of variety must be included in technique training to ensure that the athlete is adequately prepared for all possible competition situations (See Chapter 5 for further discussion).

Variety Prevents Overtraining

In addition to improving the effectivness of training, it is thought that variety may help to prevent overtraining (Bruin et al., 1994; Budgett, 1998; Charniga et al., 1986a; O'Shea, 1990; Rowbottom et al., 1998). One example

mentioned earlier is the recommendation that the training load should vary in magnitude over time (the Principle of the Wave-Like Fluctuability of the Load) and that this variation helps to prevent overtraining (Foster, Daines, Hector, Snyder, & Welsin, 1996; Tan, 1999). Variety can also be created by training in different climates and surroundings; using different daily routines; being exposed to different social environments and different emotional and mental demands; and using different training methods (Dick, 1987). Charniga et al. (1986a) suggest that any change that will give the athlete a fresh outlook on training should be considered.

The Principle of the Individual Training Response

The Principle of the Individual Training Response states that the effect of a particular training load or method varies considerably from athlete to athlete (Hawley, 2000). For example, while a certain training volume may be excessive for one athlete and result in overtraining, it may be less than adequate to stimulate adaptation in another (O'Toole, 1998). Moreover, the response to training will also vary for the same individual over time, depending on their energy level and fitness. The high individual variability in response to training considerably complicates the task of a coach in planning and implementing training.

4.3 The Basis for the Structure of the Annual Plan

According to the Classical Periodization Model, the training year is structured into a series of hierarchical cycles or periods. Although the system of dividing the annual plan into training periods is quite similar among the various authors who have described the Classical Model, the nomenclature is inconsistent and oftentimes

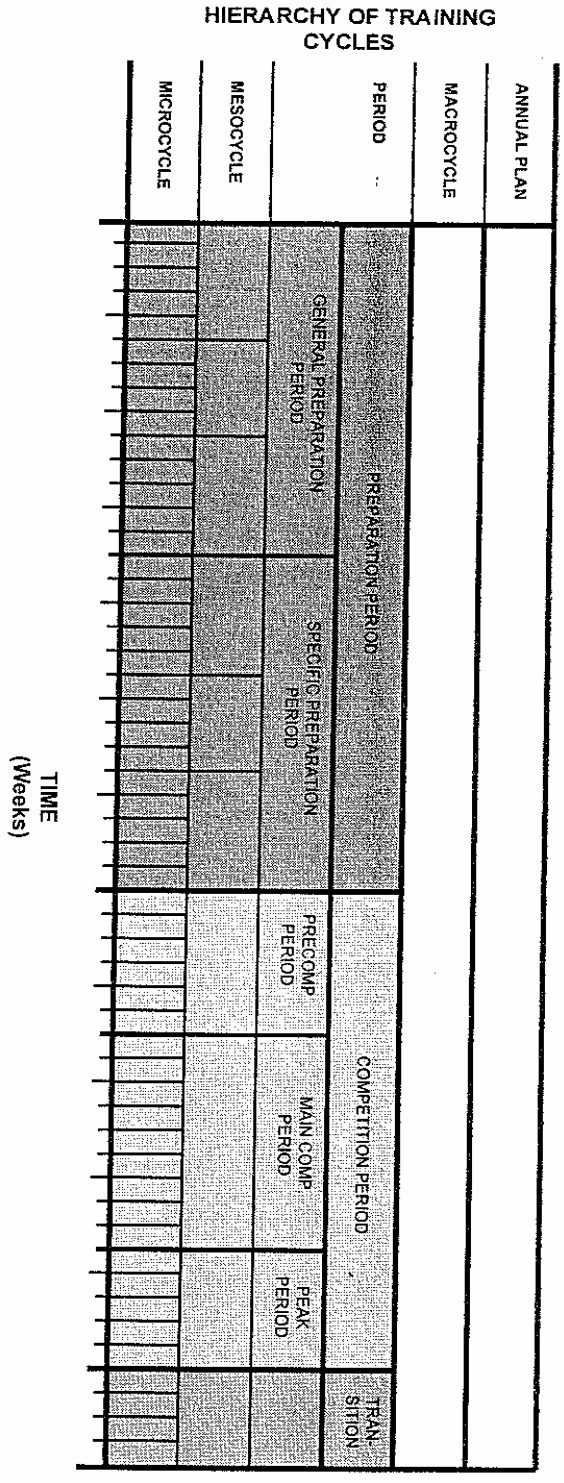

Figure 4.2 An example of an annual plan's structure following the Classical Periodization Model and showing the definitions of the terms annual plan, macrocycle, period, mesocycle and microcycle as they will be used in this thesis.

even contradictory. For this thesis I will use what I have found to be the most common names (Figure 4.2).

To begin with, the literature is relatively consistent in using the term “macrocycle” to refer to the largest of the training cycles in the annual plan. A macrocycle is a complete training cycle, beginning with the start of training, and ending after a major competition (Bourne, 1993; Bowerman & Freeman, 1991; Freeman, 1996). The annual plan often consists of one macrocycle, but may be divided up into as many as three or four.

A macrocycle is sub divided into one or two levels of “periods.” Most typically, there are three main periods, namely the preparation period, competition period, and transition period. The reasons for these divisions will be discussed shortly.

A training period, in turn, is composed of one or more “mesocycles.” A mesocycle is a training cycle which incorporates a specific phase of the athlete’s preparation (Bourne, 1993). It is generally accepted that the length of a mesocycle should be about one month, although it may range from one to four months (Matveyev, 1992; Siff & Verkhoshansky, 1996).

Finally, each mesocycle consists of a series of related “microcycles.” A microcycle is a sequence of training sessions that form a recurrent unit (Siff & Verkhoshansky, 1996). The length of a microcycle can range from five to ten days, but is most often one week.

The annual plan and its organization are of particular interest for this thesis. Specifically, the theories behind the division of a macrocycle into periods and the division of the annual plan into macrocycles according to the Classical Periodization Model will be presented here.

The Division of the Macrocycle into Periods

According to the Classical Model, three primary factors are considered in determining the structure of a macrocycle: Changing environmental conditions with the time of year; the calendar of competitions; and the cyclic development of sporting form.

Changing Environmental Conditions

One of the factors, which outdoor sports in particular need to consider, is how the environmental conditions change with the time of the year. For instance, coaches in alpine ski racing have to consider that there is less snow during the summer. At the same time however, the trend of development in modern planning is to free the preparation process from the constraints of changing environmental conditions with the seasons (Bompa, 1999; Matveyev, 1977/1981).

The Calendar of Competitions

One of the most important considerations for determining the structure of the annual plan is the selection of competitions (Berger et al., 1982; Bjørn, 1984; Bompa, 1987a; Bompa, 1999; Bowerman & Freeman, 1991; Kirksy & Stone, 1998; Matveyev, 1977/1981; Pedemonte, 1986b; Viru, 1990). Considering this importance, it is quite surprising how little literature addresses this issue, especially in regards to alpine ski racing. Nevertheless, a review of the available literature regarding competition planning is presented here. In particular, four aspects of competition planning are reviewed: the classification of competitions; the number of competitions; the distribution of competitions; and the progression of competitions.

The Classification of Competitions

Bompa (1999) reported that some coaches believe that athletes must participate in every available competition with all possible effort. He felt that with such an approach, the athlete constantly experiences stressful activities. This results in a need for many recovery days which, in turn, disrupts the course of training and violates the Principle of Continuous Load Demand.

Consequently, it has been suggested that not all competitions should be considered as equally important (Bompa, 1987a; Bompa, 1999; Gjerset & Vilberg, 1995; Matveyev, 1977/1981; McInnis, 1981). Typically, two levels of competition are identified in the literature in this regard: main competitions and preparatory competitions (Bompa, 1999; Bowerman & Freeman, 1991; Freeman, 1989; Freeman, 1996; Harre, 1982b; Matveyev, 1977/1981).

Main competitions consist of the primary competition of the year as well as any related, qualifying competitions. According to Matveyev, these events “become as if nodes of planning ... all the system of bringing the athlete to a maximum result is aimed at them” (p. 276).

On the other hand, with preparatory competitions the primary goal is to prepare for future events, rather than to peak performance for that particular race (Bompa, 1999; Bowerman & Freeman, 1991; Freeman, 1989; Matveyev, 1977/1981). In fact, preparatory competitions are thought of as part of the training process (Bompa, 1999; Gjerset & Vilberg, 1995; Harre, 1982b; Matveyev, 1977/1981; Matveyev, 1992). Purposes of preparatory competitions include testing competitive readiness, amassing competition experience, and team selections (Matveyev, 1977/1981). Often, certain technical or tactical objectives are often emphasized during the competition.

In addition to prepartory and main competitions, Gjerset and Vilberg (1995) classify competitions of the very highest priority as “top competitions.” For an elite athlete these might include an Olympics or World Championships, for example. They also define a fourth category of competitions where the primary focus is either on qualification or testing sporting form. These are referred to as “test competitions.”

The Number of Competitions

One obvious question that a coach must address when planning the competition period is the total number of competitions in which to enter (Bompa, 1999; Freeman, 1989). Determining the total number of competitions is probably an optimization problem. On the one hand, the development of sporting form in the competition period is thought to be stimulated primarily by the frequency of competition and the volume of CSP (Berger et al., 1982; Gjerset & Vilberg, 1995; Matveyev, 1977/1981). Hence, the calendar needs to be eventful enough to stimulate the acquisition and maintenance of a high degree of sporting form.

At the same time, however, it is thought that too many competitions can result in a loss of form, particularly towards the end of the competition period (Bompa, 1987a; Bompa, 1999; Freeman, 1996; Gjerset & Vilberg, 1995; Major, 1981a; Matveyev, 1977/1981; McInnis, 1981; Viru, 1990; Aamodt, 1996). Excessive competition is thought to interfere with the proper balance between recovery, training, and competition. The implication of this imbalance is three-fold.

First, a prolonged period of time consisting of only pre-start preparation and competitive starts creates monotony in the athlete’s program. This can become a negative,

psychological factor leading to the early loss of sporting form (Freeman, 1989; Matveyev, 1977/1981; Viru, 1990).

Second, excessive competition without proper recovery may result in overtraining (Kraemer & Nindl, 1998). Periodic recovery periods ensure that the athlete is adequately prepared for competition by freeing both the muscular system and the CNS from the effects of fatigue; returning energy stores to a high level; and ensuring that the athlete is desirous of competition (Bompa, 1987a; Bompa, 1999; Bourne, 1993; Bowerman & Freeman, 1991; Freeman, 1996).

Last, repetitive unloading for an excessively large number of competitions lowers the time available for training. This violates the Principle of Continuous Load Demands. If the period of competition is long enough, a decline in fitness can be expected with a corresponding drop in performance (Bompa, 1987a; Bompa, 1999; Bowerman & Freeman, 1991; Freeman, 1989; Freeman, 1996; LaVallee, 1987; Major, 1981a; McInnis, 1981; Viru, 1990; Aamodt, 1996). In addition, if the gains made each preparation period are lost during each competition period, then relatively little progress will be made from year to year (P. Refsnes, personal communication, April, 2000). Thus, it is important for the long-term development of the athlete that a coach prioritizes time during the competition period to maintain the foundations of physical fitness. Consequently, it is recommended that there should be no more than 3 to 6 main competitions per macrocycle (Matveyev, 1977/1981; McInnis, 1981).

The Distribution of Competitions

Part of selecting the events in which to participate involves determining their distribution over time. Oftentimes, the federation that sanctions competitions determines this distribution. Some common problems faced

in this connection include that too many important competitions are placed too closely together, that the competitions are distributed over a very long time, or that an important competition is placed at a time when the athlete should complete a hard training period in preparation for a major championship (Gjerset & Vilberg, 1995). In such cases, the coach has little say in the matter and must try to organize training and recovery to solve these problems in the most effective manner.

On the other hand, if the calendar of offered competitions is eventful enough, the coach may have the opportunity to be selective about which events to enter and thereby determine the nature of the distribution of competitions in the annual plan. Two approaches to scheduling the distribution of competitions are identified in the literature (Figure 4.3) (Bompa, 1999; Freeman, 1989).

“Grouping” (Bompa, 1999, p. 307) refers to the method of bunching meets up for periods of two to three weeks. This is followed by a period of reduced competition and increased training. It has been suggested that a series of preparatory starts can be bunched together to achieve an accumulating effect, thereby stimulating the athlete’s work capacity and specific endurance (Matveyev, 1977/1981; Matveyev, 1992).

The ”cyclic” (Bompa, 1999, p. 307) distribution involves planning meets in a repeating cycle, such as once every one or two weeks. In this case, a competition is followed by a short recovery, a brief period of training, and then tapering into the next competition.

The frequency of competitions should depend primarily on the individual athlete’s capacity to deal with the emotional and physical stress of competition. This will

be limited by the athlete’s training age, experience, and the demands of the sport in question (Berger et al., 1982;

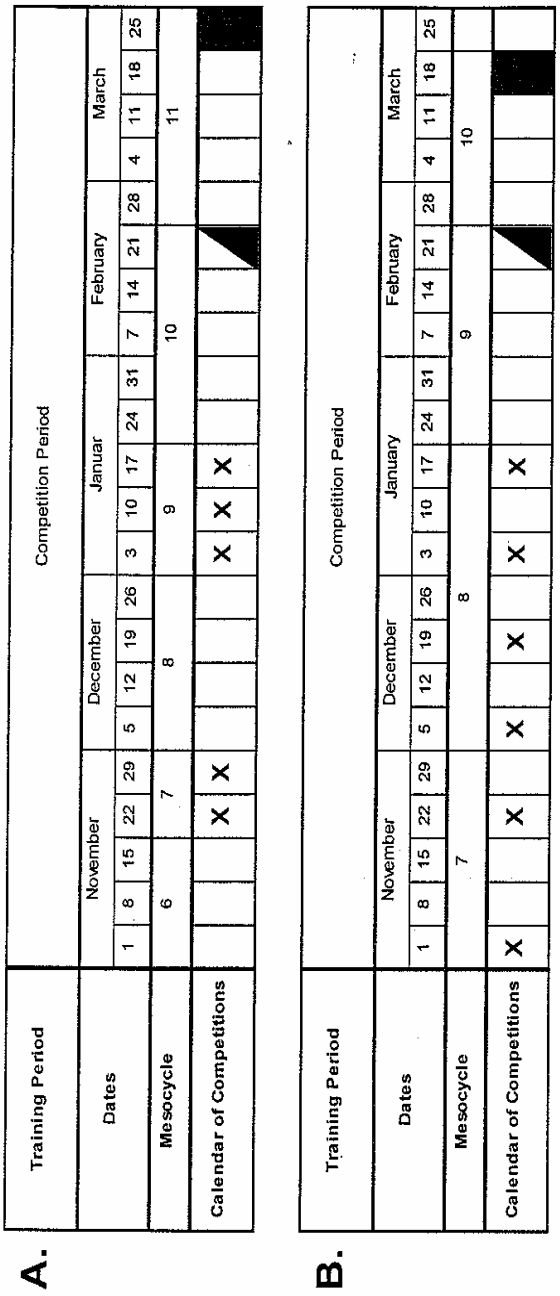

Figure 4.3 The distribution of competitions during the competition period. Graphic A and graphic B demonstrate the grouping approach and the cyclic approach respectively. Modified from Bompa (1999).

Charniga et al., 1986a; Harre, 1982b; Matveyev, 1977/1981). Ideally, there should be enough time between main competitions for the athlete to recover physically and mentally, and to eliminate through training any mistakes that have arisen (Bompa, 1987a; Charniga et al., 1986b; Harre, 1982b; Matveyev, 1992).

The Progression of Competition

The coach should also consider the progression of importance of the selected competitions. When possible, it is recommended that competitions be arranged in order of increasing significance to test the athlete in steps along the way to the season's most important events (Bompa, 1999; Freeman, 1989; Matveyev, 1992). At the same time, some authors recommend that competitions should alternate between high stress events and low stress events (Bompa, 1987a; McInnis, 1981). In so doing, one allows for periods of recovery (Bompa, 1987a).

The Cyclic Development of Sporting Form

According to Matveyev (1977/1981), the basis for the structure of the annual plan cannot be based on the climatic conditions or the competition calendar alone. Rather, the organization of training periods and mesocycles should be based primarily on the regularities of the development of "sporting form.[6]"

In his studies, Matveyev (1977/1981; 1993; 1991) observed definite trends in levels of performance of high-caliber athletes over the course of a training year. He compared these performance curves with training records and concluded that the waves in performance are the result of

[6] Sporting form in this context is used to refer to "the state of readiness of the athlete for achieving sporting result" (Matveyev, 1977/1981, p. 260). A high level of sporting form is characterized by a high degree of physical, technical, and psychological preparedness for competition.

changes in the athlete's sporting form. Moreover, he concluded that there is a cyclic development of sporting form in which the acquisition of high sporting form is followed by its stabilization and, finally, a temporary loss of form prior to a new development cycle (Figure 4.4). This conclusion has found widespread support in the literature (Bondarchuk, 1993; Freeman, 1989; McInnis, 1981; Tan, 1999).

During the first phase, termed "Acquisition" (Matveyev, 1977/1981, p. 263), the athlete develops the physical, psychological, and technical foundation on the basis of which sporting form is built. During the "Stabilization of Form", the second phase, a high level of sporting form is established, stabilized, and realized in competition. At this time, the athlete shows a relative stability in performance and an optimum readiness for competition. At some point however, a loss must occur leading to the third phase, the "Loss of Form." Two primary causes are given in the literature for why this loss must occur.

Firstly, stabilizing form at a high level requires a significant volume of competition and intensive training, both of which are physically and psychologically very stressful. In order to prevent overtraining or injury, these periods of high stress should be alternated with periods of low stress (Bompa, 1987b; Fry et al., 1992b; Lester, 1993; Matveyev, 1977/1981; Tan, 1999; Viru, 1990). However, during an extended recovery period the athlete detrains – according to the Principle of Reversibility – and the previously acquired level of sporting form is lost as a result.

A second cause for the necessary loss in sporting form is that maintaining a certain level of form is counterproductive to the further advancement of the athlete. In order to improve, a considerable volume of

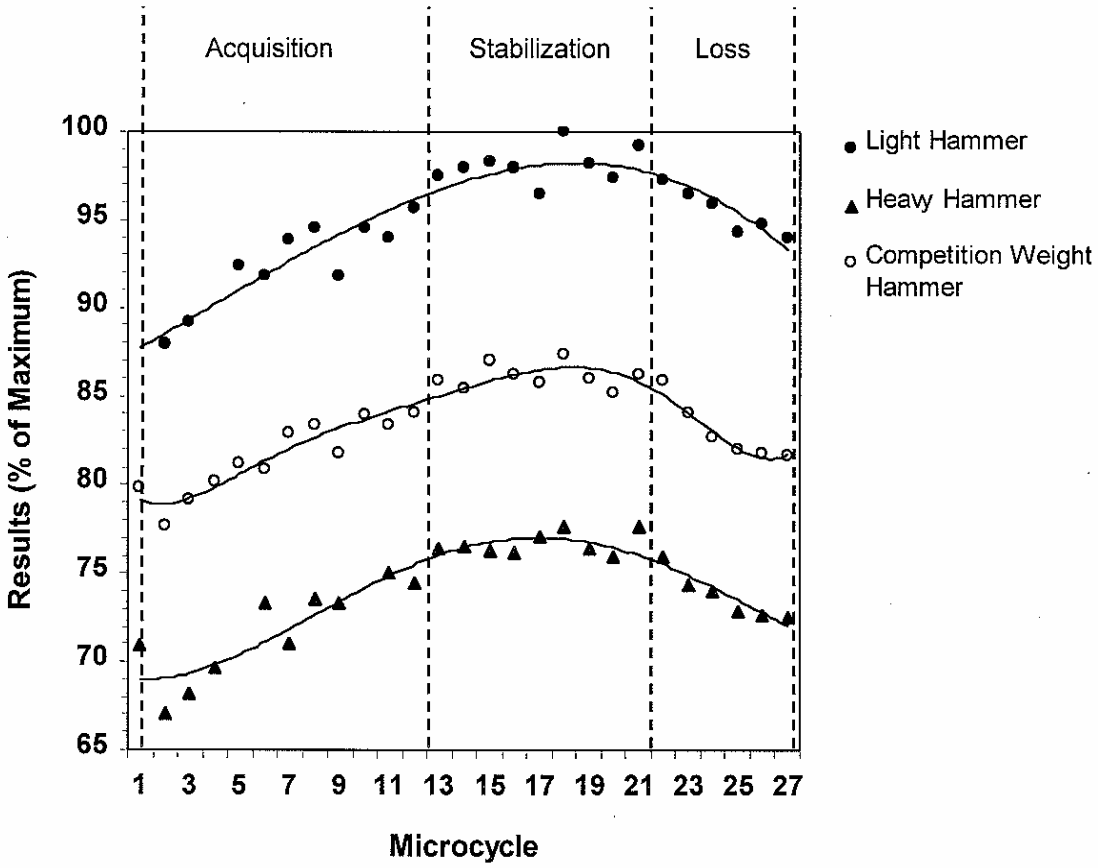

Figure 4.4 The acquisition, stabilization, and loss of sporting form as measured in the performance of an elite hammer thrower from the former Soviet Union according to Matveyev (1993)

physical training and technical modifications are typically needed, more than what the framework of stabilized form allows (Matveyev, 1977/1981). This means that an athlete must shed his old form in order to progress further.

Based on the three phases of the development of form, the Classical Model divides each macrocycle into three corresponding periods (Berger et al., 1982; Bompa, 1999; Bowerman & Freeman, 1991; Dreschler, 1998; Matveyev, 1977/1981; Matveyev, 1992; Tan, 1999). During the first period, commonly called the preparation period, the pre-requisites for a new level of sporting form are created. In the competition period, the second period, sporting form is established, stabilized, and ultimately realized in competitions. Finally, in order to prevent overtraining before beginning a new development cycle, a period of rest is given, called the transition period. Each period prepares the athlete for the next until the athlete's sporting form peaks at the most important competition of the year (Bowerman & Freeman, 1991; Fry et al., 1992b). The goals and types of training for each of these periods are discussed in greater detail in the following sections.

The Preparation Period

In the preparation period, the pre-requisites for a new, higher level of sporting form are created. This includes further developing the basic level of conditioning and improving technique (Bompa, 1987b; Bompa, 1999; Bowerman & Freeman, 1991; Charniga et al., 1986a; Dreschler, 1998; Freeman, 1989; Matveyev, 1992; McInnis, 1981). It is thought that the longer and more solid the preparation period, the higher the probability of prolonging the time frame that sporting form can be stabilized at a high level (Berger et al., 1982; Bompa, 1987a; Bompa, 1999; Matveyev,

1977/1981; Matveyev, 1992). Two main stages of the preparation period are generally recognized.

The General Preparation Period: Training to Train

The first stage of the preparation period is referred to as the general preparation period. Following the Principle of Multi-Lateral Development, the primary aim during this period is to create a general base of physical conditioning to support the sport specific training during the second stage (Berger et al., 1982; Bompa, 1994; Bompa, 1999; Dick, 1975; Kibler & Chandler, 1994; Kirksy & Stone, 1998; Matveyev, 1977/1981; Matveyev, 1992; Pahlke & Peters, 1997; Viru, 1990; Woodman & Jarver, 1991). This stage has been aptly referred to in this context as "training to train" (Dick, 1997, p. 257). At this point of the annual plan, the volume of training is relatively high and is increased progressively. At the same time, the intensity of training is kept relatively low.

Although the primary focus in training during this period is on GP, a certain level of SP and CSP are also included to ensure that these components are developed continuously (Charniga et al., 1986a). In particular, an emphasis may be placed on technical development for sports with high and varied demands on technical skills (Berger et al., 1982; Bompa, 1994; Matveyev, 1977/1981; Woodman & Jarver, 1991). However, SP should be performed at a volume that does not interfere with the physical training (Matveyev, 1977/1981; Viru, 1990). Competition is usually excluded during this period as the athletes are not ready to test their skills against opponents (Bompa, 1999).

The Special Preparation Period: Training to Compete

The special preparation period is often recognized as the hardest working phase of the year (Dick, 1975). The direct establishment of sporting form is the focus. Accordingly, the ratio of GP to SP changes in favor of SP

(Dick, 1975; Woodman & Jarver, 1991). In this context, Dick (1997) has referred to this period as “training to compete” (p. 257). The volume of training increases through the middle of this period. At that time, volume drops progressively, and the intensity of training begins to rise (Bompa, 1999; Woodman & Jarver, 1991).

According to Bompa (1999), a main goal during this mesocycle should be the improvement of technical and tactical elements. Technique should be stabilized mainly by workouts specific to competition conditions. In this way, a high stability of technique under competition conditions is achieved (Berger et al., 1982; Dick, 1975; McInnis, 1981; Woodman & Jarver, 1991). Towards the end of this mesocycle, the athlete should be exposed to more “open” competition situations, such as wind, rain, noise, etc. (Dick, 1975).

The Competition Period

During the competition period, the main task is to create the most favorable conditions for realization of the acquired sporting form in races (Berger et al., 1982; Bjørn, 1984; Bompa, 1999; Charniga et al., 1986a; Matveyev, 1977/1981). This includes tasks such as the perfection of technical skills under competition conditions (Bompa, 1999; Matveyev, 1977/1981; Woodman & Pyke, 1992) and gaining competitive experience (Bompa, 1987b; Bompa, 1999). Physical goals include reaching the maximum level of special preparedness and stabilizing this level (Bompa, 1999; Matveyev, 1977/1981; Woodman & Pyke, 1992).

In general terms, it is recommended that the competition period not be longer than the length of time over which sporting form can be maintained without being a detriment to the athlete’s long term development (Matveyev, 1977/1981). For long competition periods, a number of

authors suggest dividing the season into separate periods to maintain a proper balance between competition, recovery and training (Bompa, 1994; Bompa, 1999; Bowerman & Freeman, 1991; Dick, 1975; Freeman, 1989; Harre, 1982b; Viru, 1990; Viru, 1995). How this is accomplished varies slightly from author to author. Nevertheless, four general classifications of periods can be identified. These include pre-competition periods, training periods, main competition periods, and recovery periods.

The Pre-Competition Period: Competing to Learn

The aim of the pre-competition period - typically the first period in the competition season - is to finalize the acquisition of a high level of sporting form. At this time, a number of preparatory competitions are often included in the program to expand the athlete's competitive experience and to consolidate technique under competitive conditions (Bompa, 1999; Freeman, 1989; Harre, 1982b; Matveyev, 1977/1981; Woodman & Jarver, 1991). However, Matveyev warned that these competitions should not lose their preparatory character. In fact, they should be looked at as an integral part of the training process. When possible, the competitions should be modified to emphasize the development of what Matveyev (1977/1981) referred to as "immunity to interference" (p. 135). Any changes in conditions which may arise in competition and affect the competitor's performance should be simulated (Bompa, 1999). As Freeman (1989) wrote, "Athletes must be prepared to compete in **meet** [emphasis added] conditions, not simply if the conditions are ideal" (p. 28).

Training during this period is characterized by a maximum intensity and a reduced volume (Harre, 1982b; McInnis, 1981; Woodman & Jarver, 1991). According to Matveyev (1977/1981), the guiding rule in technique training should

be “Better fewer, but better” (p. 277). Physical conditioning, with an emphasis on SP, reaches a maintenance stage (Woodman & Jarver, 1991).

The Training Period

Special periods of training are often included during the competitive season. The timing of these periods depends on the specifics of the sport. These periods may include technical training, physical training, or both. Often, the reasons for having a training period include maintenance of sporting form, preparation for a major championship and recovery.

When there is a sufficiently long period of time between the last competition and the primary championship of the year, a special training period is often used in the final preparations for the event (Kirksy & Stone, 1998). The length of time available for such a period is limited by the competition calendar and the time needed by the athlete for physical and psychological recovery (Bompa, 1999). The training in this period is typically characterized by a very low volume, high intensity, and high degree of specificity (Kirksy & Stone, 1998). One of the primary goals is to eliminate faults that have been observed in training (Harre, 1982b).

At some points in the year, training periods are taken with the purposes of recovery from competition and SP. When such is the case, training should consist primarily of GP.

The Main Competition Period: Competing to Win

The aim during a main competition period is to optimize performance in competitions (Bompa, 1999; Woodman & Jarver, 1991). It is here that the best performances of the year are. During this period there is an increase in training intensity, reaching the highest levels two to

three weeks prior to the main competition (Bompa, 1999). The number of preparatory competitions leading up to the main event should be kept to a minimum so as to avoid unnecessary fatigue (Woodman & Jarver, 1991).

The Recovery Period

During the competition period, the athlete is exposed to a high degree of stress. It is important to alternate periods of high stress with periods of recovery (Berger et al., 1982; Bompa, 1999; Freeman, 1989; Matveyev, 1977/1981; Verkhoshansky, 1985/1988). Failing to include recovery periods will eventually result in a loss of sporting form (Bompa, 1987a; Freeman, 1989).

The Transition Period

Due to the high level of physical and psychological stress experienced by the athlete during the competition period, it is important to have a period of recovery prior to the beginning of a new preparation period (Berger et al., 1982; Bowerman & Freeman, 1991; Dick, 1975; Dreschler, 1998; Freeman, 1989; Kibler & Chandler, 1994; Matveyev, 1977/1981; Siff & Verkhoshansky, 1996; Woodman & Jarver, 1991). This final period of a macrocycle is called the transition period.

According to Bompa (1999) the primary goal of the transition period is recovery from CNS fatigue. This not only aids in preventing overtraining (Matveyev, 1977/1981) but also enhances the next phase of training by providing rest and adaptation so that future training can be performed at a higher level of effort (Charniga et al., 1986a; Charniga et al., 1987; Maglischo, 1993; McInnis, 1981). The transition period also gives the athletes a chance to pursue other interests in their lives (Maglischo, 1993).

Length of the Transition Period

The transition period should be planned in such a manner that the athletes return to training fully recovered and motivated to train (Bompa, 1999; Charniga et al., 1987; Dick, 1987). Hence, the length of the transition period depends on the total volume of the proceeding preparation and competition periods and the terms necessary for the athlete to recover fully (Fry et al., 1992b; Matveyev, 1977/1981; Verhoshansky, 1993).

Previously, it was recommended that the Transition Period last about four weeks (Berger et al., 1982; Bompa, 1999; Freeman, 1989; McInnis, 1981; Woodman & Jarver, 1991). However, authors are now starting to recommend much shorter lengths for highly trained athletes. They feel that if the recovery period is too long, the athlete will detrain (The Principle of Reversibility) – especially in specific fitness - and a substantial amount of time at the beginning of the new macrocycle will have to be spent regaining previously established fitness levels (Maglischo, 1993; McInnis, 1981; Spassov, 1988; Viru, 1995).

For instance, Maglischo (1993) reported that 1 to 2 weeks provided enough time for regeneration while not being so long that detraining occurs in swimmers. Similarly, Lange (1999) found that reducing the length of the transition period to two to three weeks was a major contributor to the long term performance development of runners from Asia. While it is felt that such strategy is necessary due to the high levels of competition, it must be realized that a consequence of reducing the duration of the transition period is likely to be a shorter competitive career (Spassov, 1988).

Types of Activities

Generally stated, the training methods used in the transition period should be chosen such that the recovery of the athlete is complete and so that the athlete's level of conditioning is maintained at as high a level as possible (Berger et al., 1982; Bompa, 1999; Matveyev, 1977/1981; Woodman & Jarver, 1991). The literature is adamant that rest should not be viewed as inactivity. Instead, it should be seen as relief from a particular activity (Dick, 1987).

Matveyev (1977/1981) suggested that by looking for a change in the entire character of training, recovery could be enhanced. Consequently, it is recommended to include a fair amount of general preparation type activities and cross training in other sports (Charniga et al., 1987; Dick, 1987; Dreschler, 1998; Kibler & Chandler, 1994; Lange, 1999). According to Freeman (1989), it should be activities that "free the mind" from training and competition. It is typically recommended not to include any SP or CSP at this time (Bowerman & Freeman, 1991). However, Matveyev (1977/1981) wrote that use of special methods could be permitted in certain situations to maintain a special level of training or to work on technique. At the same time however, he also warned that such training should not be at the expense of a complete rest.

The Division of the Annual Plan Into Macrocycles

The second aspect of the structure of the annual plan of interest in this thesis is the division of the year into macrocycles. Traditionally, one macrocycle is planned per year. This is referred to as single periodization. In recent years however, there has been a trend towards using two and even three macrocycles over the course of a year – referred to as double and multiple periodization - in the

training of highly qualified athletes (Dreschler, 1998; Siff & Verkhoshansky, 1996; Stein, 1998; Verkhoshansky, 1985/1988). For example, double periodization has been successfully applied in the sports of swimming and track and field (Bourne, 1993; Dick, 1976; McInnis, 1981). Francis (1992) reported that since the addition of the IAAF Grand Prix circuit in 1985, triple periodization has been used in the sprinting events of track and field due to the large number of competitions.

Typically, the total number of macrocycles depends on the annual structure of competitions. In particular, the main competition peaks are used to determine the overall structure of the year with one macrocycle for each peak (Berger et al., 1982; Bjørn, 1984; Bompa, 1987a; Bompa, 1999; Bowerman & Freeman, 1991; Freeman, 1989; Kirksy & Stone, 1998; Matveyev, 1977/1981; Pedemonte, 1986b; Viru, 1990). In sports where there is only one competition period, a second competition period can be simulated through the use of intra-team competitions (Bourne, 1993). A number of reasons for the advantage of multiple periodization for qualified athletes are mentioned in the literature.

First, and perhaps most important, multiple periodization increases the proportion of SP completed over the year (Balyi & Hamilton, 1995; Matveyev, 1977/1981; McInnis, 1981; Stein, 1998; Suslov, 1974). For highly trained athletes, an increased proportion of SP is important to make further progress. In addition, the increased proportion of SP enhances the opportunity for the development of technical skills and psychological strategies for coping with competition (Bourne, 1993; Dick, 1976; McInnis, 1981; Suslov, 1974).

Second, multiple periodization helps break up what would be a very long and monotonous preparation period (Bompa,

1987a; Bourne, 1993; Maglischo, 1993; McInnis, 1981; Suslov, 1974; Viru, 1990). It is thought that the more rapid sequence of competition periods using multiple periodization prevents the fall off of competitive performance associated with a dulling of the training effect over a long preparation period (Dick, 1976; McInnis, 1981; Viru, 1990). This may be at least partially a psychological issue. According to Bourne (1993) by shortening the lengths of training periods through the use of multiple periodization, one creates a better environment for training as “the light can always be seen at the end of the tunnel” (p. 17). This, in turn, may allow for a greater intensity and focus in training.

Lastly, it has been suggested that the more frequent recovery periods associated with multiple periodization may lower the risk of overtraining in highly trained athletes (Maglischo, 1993).

Although the literature is relatively unanimous in its support of multiple periodization, some authors have voiced some concerns about its use. For example, it is felt that the coach should ensure that a short transition period is included after each competition period to avoid overtraining (Viru, 1990). Additionally, Dick (1976) and Charniga et al. (1987) have emphasized that training should begin with GP again after a transition period and then gradually build up to SP.

Secondly, it is thought that single periodization is best for younger, developing athletes (McInnis, 1981). For one, it is believed that multiple periodization, with its rather limited periods of preparation, results in incomplete mastery of technique and a reduced rate of development in the foundations of fitness, important aspects of the long-term development of an athlete (Dick, 1976; Matveyev, 1977/1981; McInnis, 1981). Moreover,

developing athletes may not be psychologically prepared for the level of intensity and focus in training required of multiple periodization. If an athlete decides to lay back for a period, the total training volume may not be enough to stimulate a stable training effect (Maglischo, 1993). It is therefore felt that the use of multiple periodization may lead to burnout and overtraining in athletes who are not adequately prepared for it (Balyi & Hamilton, 1995; Bompa, 1999).

4.4 Criticism of the Classical Periodization Model

In recent years, the Classical Model has come under criticism from a number of researchers and authors in training theory, particularly where the preparation of elite athletes is concerned (Bondarchuk, 1988; Gambetta, 1989; Gambetta, 1991; Tschiene, 1993; Verhoshansky, 1993; Verhoshansky, 1995). This criticism has been especially strong in Russia (Brunner & Tabachnik, 1990), where the former Vice President of the State Committee of Sport has been quoted as saying that participants of high performance sport “should not continue to follow the outdated system of Professor Matveyev” (Verhoshansky, 1999, p. 15). While this debate has received recent attention in the German literature (Platanov, 1999; Selujanov, 1999; Verchoshasnkij, 1998), it has gone almost completely unnoticed in the English language literature (Siff & Verkhoshansky, 1996). Essentially, critique of the Classical Model boils down to two main points.

It Does not Take into Account Our Knowledge of Biology

First, it is thought that the Classical Periodization Model is primarily based on empirical evidence and does not take into account our knowledge of the sport sciences, in particular sport biology (Balyi, 1992; Brunner & Tabachnik, 1990; Satori & Tschiene, 1988; Siff &

Verkhoshansky, 1996; Tschiene, 1993; Tschiene, 1995; Verkhoshansky, 1985/1988). Selujanov (1999) feels that the foundation of the Classical Periodization Model is based primarily on educated guesses rather than the scientific evidence that has been accumulated in the sport sciences.

It Has not Evolved to Take into Account the Demands of Modern Sport

Second, the Classical Periodization Model has not evolved to take into account the demands of modern, high performance sport (Selujanov, 1999; Siff & Verkhoshansky, 1996; Verhoshansky, 1995; Verhoshansky, 1999). In particular, these changes in sport include drastically increased competition volumes, increased levels of competition, and the fight against drug use.

Increased Competition Volumes

The total number of competitions per year in which elite athletes are participating has increased dramatically in recent years (Gambetta, 1989; Gambetta, 1991; Horwill, 1991; Verhoshansky, 1999; Zajac & Prus, 1988). For example, rather than one important competition per season, an alpine ski racer may have upwards of 40 World Cup races in one season, all of which are important. The introduction of more competitions has lead to changes in peaking strategy. Rather than building up to peak for one main competition, as generally associated with the Classical Model, the goal is often to reach a high level of sporting form and maintain that level for the duration of the competition period.

Increased Levels of Competition

With increased opportunities to make a living in high performance sport, the level of competition has risen

steadily in recent years. As a result of this increased competition, greater demands are being placed on the level and reliability of the athlete's preparation (Reiss & Tschiene, 1996; Tschiene, 1993). In this regard, it is believed that the Classical Model is inadequate in two ways.

First, it is thought that the Classical Model relies too much on increasing the training volume to stimulate improvement (the Principle of Load Progression). For highly trained athletes this has resulted in such extreme training volumes that problems such as overuse injuries and overtraining have arisen (Balyi & Hamilton, 1995; Costill et al., 1991; Tschiene, 1995; Verhoshansky, 1996).

Secondly, it is believed that as an athlete becomes more trained, the value of GP diminishes rapidly (Rushall, 1992). This has stimulated critique of the prolonged periods of GP characteristic of the Classical Model. As Lilia Nuratlinova[7] said in an interview, too much general preparation "can mean a lot of training and no results" (Smith, 1992, p. 3835). Some authors have gone so far as to suggest that a prolonged peiod of GP provides such a small stimulus to highly trained athletes that there is a danger of detraining in the athlete's level of special preparation (Brunner & Tabachnik, 1990; Francis & Patterson, 1992). This detraining may not only mean lost time to retraining, but also an increased danger of injury when the athlete begins with SP later in the training year. For instance, Francis and Patterson (1992) reported that long periods of GP resulted in higher rates of hamstring injury during the SP of highly qualified sprinters. They proposed further that by maintaining a focus on SP methods throughout the year the incidence of these injuries could be reduced.

[7] Lilia Nurutdinova is an elite middle distance runner from the former Soviet Union.

The War Against Doping

One of the reasons for drug use in sport is to reduce the recovery time from training. This, in turn, allows the athlete to train a much higher volume and intensity. One could argue that if the IOC and various sport federations are successful in limiting the use of drugs, then athletes will not be able to train at such high volumes without being injured or overtrained. Due to the extremely high volumes that elite athletes must complete using the Classical Model, the emphasis in training will be forced to shift towards finding a more efficient organization of training (Gambetta, 1989; Tschiene, 1993).

As a result of these changes in the demands of modern sport, contemporary theorists believe that we must look for a more effective training organization than that of the Classical Model, particularly for highly qualified athletes (Brunner & Tabachnik, 1990; Kashlakov, 1971; Matveyev & Giljatsova, 1991; Reiss & Tschiene, 1996; Satori & Tschiene, 1988). New approaches to training should raise its effectiveness while optimizing the use of the athlete’s time and energy (Verhoshansky, Mironenko, Antonova, & Hachatarian, 1991).

CHAPTER 5. THE EXERCISE PHYSIOLOGY MODEL

5.1 Introduction

Based on the criticism of the Classical Periodization Model, a new basis for the planning of training was introduced in the literature in the 1980's, led by Verkhoshansky in Russia and Tschiene in Germany. The purpose of this chapter is to give the reader an overview of the salient aspects of this revolutionary model, referred to in this thesis as the "Exercise Physiology Model."

According to this model, knowledge of how the human body adapts to training - and not the cyclical development of sporting form as described by Matveyev (1977/1981; 1993) - should be the primary consideration in designing the annual plan (Siff & Verkhoshansky, 1996; Tschiene, 1993; Tschiene, 1995; Verhoshansky, 1993; Verhoshansky, 1995; Verkhoshansky, 1996). Verkhoshansky sees the relationship between the athlete's physiological capacities and the demands of his or her physical activity as characterized by homeostasis under normal circumstances. However, when the activity level is increased, as in training, an imbalance is created that induces the body to adapt its functional mechanisms so as to re-establish homeostasis (Fry et al., 1992b; Siff & Verkhoshansky, 1996). Hence, from the perspective of the Exercise Physiology Model, the aim of the training process should be to apply a series of stimuli that will disrupt the homeostasis of the athlete's

physiological systems and thereby induce adaptation (Fry et al., 1992b).

The result of this adaptation is what Verkhoshansky refers to as a “training effect” (Verkhoshansky, 1985/1988, p. 84). There are in fact several different levels of training effect described in the literature. The “acute training effect” (Dick, 1997, p. 188) is the body’s short-term response to the stress of training. This includes such reactions as increased heart rate, sweating, increased lactate concentrations, and fatigue. The “delayed training effect” (Dick, 1997, p. 188) on the other hand, is the alteration in the athlete’s state a short time after a workout. The body adapts itself so that the next time a similar training session is carried out, it will not be as great of a stress. Over a longer period of time, the acute and delayed training effects of many workouts combine to form what is termed the “cumulative training effect” (Siff & Verkhoshansky, 1996, p. 353). According to the Exercise Physiology Model, attainment of a stable, cumulative training effect is the main goal of training and the annual plan should be designed accordingly.

There are two factors that influence the cumulative training effect of a given training program - the athlete’s state and the training potential of the loading (Figure 5.1). The training potential is the training’s capacity for stimulating adaptation and thus promoting the corresponding training effects (Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988). When planning training, the coach determines the training potential of the loading.

Three factors play a role in determining the training potential. The contents of the loading refers to the actual exercises and training methods. The volume of the

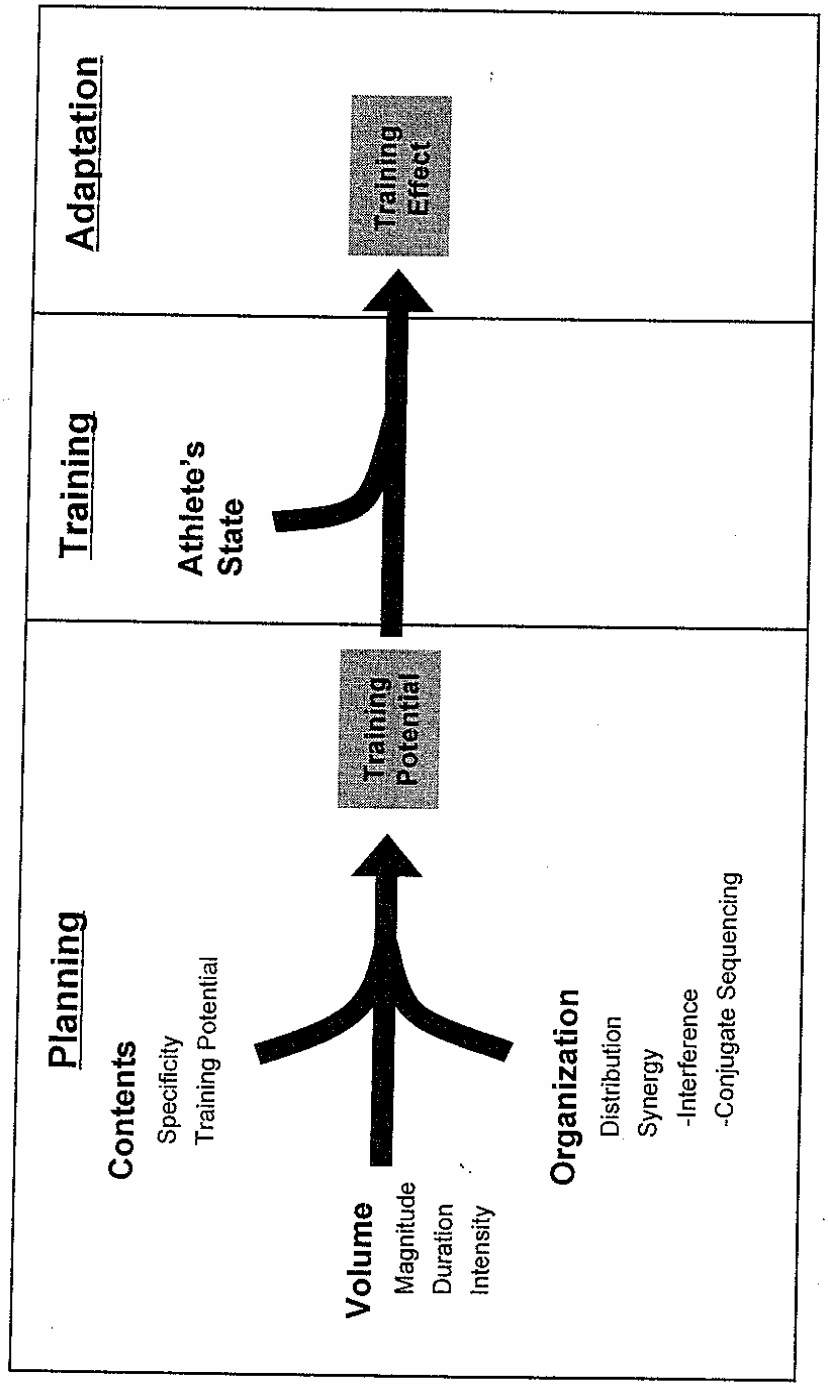

Figure 5.1. My interpretation of Verkhoshansky's view of training and adaptation.

loading refers to the total amount and intensity of the training. The organization of the loading refers to how the training is structured in time.

As the purpose of this chapter is to review the aspects of the Exercise Physiology Model in connection with designing the annual plan, it is organized according to the factors that Verkhoshansky has defined as having an influence on the training potential of the loading (Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988). Accordingly, there are three main sections, one each for the contents, volume and organization of training. In addition, some of the criticism of the Exercise Physiology Model is summarized.

5.2 The Contents of the Training Load

The “contents” of the training load refers to the actual activities and methods which are employed in training (Siff & Verkhoshansky, 1996). In connection with the contents of training, two primary differences between the Classical and Exercise Physiology Models exist.

Increased Emphasis on the Specificity of Training

As discussed previously, one of the criticisms of the Classical Periodization Model is the use of prolonged periods of GP. It is thought that in order to improve performance, highly trained athletes require training of both a higher training potential and specificity than what GP methods offer (Brunner & Tabachnik, 1990; Francis & Patterson, 1992; Müller, Raschner, & Schwameder, 1999; Rushall, 1992; Siff & Verkhoshansky, 1996; Stein, 1998). Hence, there has been a trend towards more specific training with a high intensity throughout the year (Bjørn, 1984; Gambetta, 1991; Satori & Tschiene, 1988). Indeed,

the current trend is, after a short break following the competition period, to begin immediately with SP methods and to continue these throughout the training year (Gambetta, 1989).

The Use of General Preparation

The second difference between the Classical and Exercise Physiology Models in terms of the contents of training concerns the role that GP plays in the preparation of the athlete. Under the Classical Periodization Model, GP is used according to the Principle of Multi-Lateral Development. However, under the Exercise Physiology Model, the main function of GP is to enhance recovery from SP by providing variety in the training program (Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988).

This difference in the role of GP results in two different distributions of GP means over the training year. In contrast to the Classical Model, there is relatively little GP in the preparation period according to the Exercise Physiology Model. Instead, the proportion of GP increases as the importance of recovery increases, reaching a peak during the later portions of the competition period (Siff & Verkhoshansky, 1996).

5.3 The Volume of the Training Load

The second planning factor that can influence the training potential is the “volume” of the training load. It is thought that the process of adaptation requires a substantial amount of energy (Verkhoshansky, 1985/1988), and that the amount of energy available for adaptation limits the extent to which one should train before allowing for regeneration (Nurmekivi, 1997; Viru, 1990). Verkhoshansky has termed this limited energy resource as the “current adaptation reserve” (p. 29) or CAR.

According to the Exercise Physiology Model, the focus of the coach in determining the volume of the training load – both the magnitude and duration of the load - for a particular training period should be in the full exploitation of the athlete's CAR (Satori & Tschiene, 1988; Verhoshansky, 1995; Verhoshansky, 1998; Verkhoshansky, 1985/1988; Verkhoshansky, 1996). This entails a problem of optimization. While a certain volume of training must be completed to adequately stimulate a stable cumulative training effect (Nurmekivi, 1997; Plekhov, 1991a), surpassing the athlete's CAR results in a dulling of the training effect. In severe cases, even a negative training effect is possible (Berger et al., 1982; Dreschler, 1998; Matveyev, 1977/1981; Plekhov, 1991a; Rushall, 1993; Siff & Verkhoshansky, 1996; Verhoshansky, 1996; Verhoshansky et al., 1991; Verkhoshansky, 1985/1988; Verkhoshansky, 1996). Thus, it is necessary to determine how long a particular training regimen can be followed without dulling the effect of that training (Gambetta, 1991).

Complicating this decision for the coach is that the CAR shows both individual differences as well as differences for the same individual depending on their current training status. Moreover, the CAR varies according to the particular physical capacity being trained. For instance, it is thought that strength training programs lose their efficiency after a relatively short period of time due to the body's rapid adaptation (Tan, 1999).

Recommendations for the length of training periods vary in the literature from two to four weeks on the low end to 10 to 12 weeks on the high end (Brunner & Tabachnik, 1990; Holmes, 1999; Maglischo, 1993; Verhoshansky, 1996). Once the CAR has been exhausted through a period of training, a period of recovery and regeneration is necessary. This

makes a cyclic construction between training and recovery necessary (Viru, 1990; Viru, 1993b; Viru, 1995).

5.4 The Organization of the Training Load

The third planning factor affecting the training potential according to the Exercise Physiology Model is the organization of the training load. This refers to how training is structured into training periods over the course of the annual plan. According to proponents of the Exercise Physiology Model, the primary consideration to be given in determining the organization of training is the goal of achieving a peak in the cumulative training effect at the time of the competitions (Gambetta, 1991; Satori & Tschiene, 1988; Siff & Verkhoshansky, 1996; Tschiene, 1995; Verhoshansky, 1993; Verkhoshansky, 1985/1988). In this connection, there are two aspects of the annual plan which deserve attention - the distribution of the training means and the relationships between training of different primary emphases. These are discussed in the next two sections. The implications that these two aspects have for the structure of the annual plan is then presented.

The Distribution of the Training Means

The distribution of the training means refers to how different training means are spread over time. Generally speaking, two types of training distribution can be identified in the literature: distributed, complex training and concentrated, unidirectional training.

Distributed, Complex Training

Distributed, complex training – also referred to as “polyvalent” training (Calder, 1992, p. 1968) – makes use of a number of training tasks with different primary emphases simultaneously for prolonged periods of the

annual plan (Brunner & Tabachnik, 1990; Maglischo, 1993; Siff & Verkhoshansky, 1996; Viru, 1995). The Classical Periodization Model typically makes use of complex training while varying the emphasis depending on the time of the season (Maglischo, 1993; Verhoshansky, 1993; Verhoshansky, 1995; Verhoshansky, 1996). In this situation, the training effect is regulated primarily by the wave-like dynamics of the training volume and intensity (Verhoshansky, 1993).

Proponents of complex training believe that it leads to greater improvements in performance than unidirectional exercise for several reasons. First, it is thought that unidirectional training leads rapidly to monotony and eventually to a dulling of the training effect (Brunner & Tabachnik, 1990; Maglischo, 1993; Siff & Verkhoshansky, 1996). Conversely, it is believed that complex training provides the variety in the training stimulus necessary to provoke a continual improvement in performance (Calder, 1992).

Second, it is believed that all physiological systems are inter-related and ultimately dependent upon each other. Furthermore, it is thought that the development of one motor ability contributes to the development of others (Brunner & Tabachnik, 1990; Siff & Verkhoshansky, 1996). Hence, it has been suggested that the athlete achieves a balanced and multi-faceted fitness through complex training.

Concentrated, Unidirectional Training

The Exercise Physiology Model rejects the use of distributed, complex training as suitable for highly qualified athletes. The reason for this is two-fold. First, to spread SP over an extended period of time is thought to be of too low a stimulus for adaptation to

occur in highly trained athletes. It seems that by concentrating SP means into short blocks of time, a greater stimulus can be achieved (Brunner & Tabachnik, 1990; Siff & Verkhoshansky, 1996). Second, when certain modes of training are used concurrently, interference effects are thought to reduce the quality of the training (Müller et al., 1999; Verhoshansky, 1993) (For a further discussion, see Interference, p. 93). Consequently, there has been a tendency in recent years to concentrate the training of a single, primary emphasis into short blocks of time (Siff & Verkhoshansky, 1996; Stein, 1998; Verkhoshansky, 1985/1988; Viru, 1995). This is referred to as concentrated, unidirectional training (Verkhoshansky, 1985/1988).

Research cited by authors supporting the use of concentrated, unidirectional training shows that it is a more efficient organization than complex training (Brunner & Tabachnik, 1990; Nurmekivi, 1997; Viru, 1995). For example, it has been reported that the use of concentrated loads allows the total year volume of strength training to be reduced between 13-15% (Siff & Verkhoshansky, 1996) and 15-20% (Brunner & Tabachnik, 1990) when compared to the complex method while at the same time making better improvements in performance. Similarly, it has been reported that anaerobic endurance training is more effective when concentrated in time (Verkhoshansky, 1985/1988):

> *”It has been shown that the distribution of glycolytic work in the year cycle of highly qualified sprinters manifests itself in increased loading volume, but does not lead to an increase in the effectiveness of loading. However, by concentration of the volume of glycolytic work at certain stages, the work was executed at a smaller volume of loading, but achieved a more significant displacement in the athlete’s speed endurance.” (p. 102)*

In addition to providing a stronger stimulus for adaptation for highly trained athletes, the concentrated, unidirectional distribution also benefits in a more economical use of the athlete's time and energy (Verhoshansky, 1996). Unidirectional training has been reported to be appropriate for strength and power, speed, and anaerobic endurance training (Siff & Verkhoshansky, 1996).

Synergy

Gambetta (1991) has pointed out that peaking of the cumulative training effect involves looking at the interaction and sequencing of the training of different functional capacities. He referred to this concept as "synergy" (p. 24). Two important aspects of synergy discussed in the Exercise Physiology Model literature are important for the design of the annual plan: interference and conjugate sequencing.

Interference

Interference refers to the situation where certain training methods can cause contradictory training effects if proper timing and sequence are not used (Gambetta, 1991; Viru, 1995). The result is often a less than optimal cumulative training effect. Two instances of interference in particular have received attention in the literature.

Training for Maximum Strength and Aerobic Endurance

First, there is some evidence that simultaneous training for both maximum strength and aerobic endurance may compromise the development of strength (Hennessy & Watson, 1994; Kibler & Chandler, 1994; Kraemer & Nindl, 1998; Kraemer et al., 1995; Nurmekivi, 1997; Satori & Tschiene, 1988; Tan, 1999; Tanaka & Swensen, 1998). This type of

interference appears to be particularly true for the development of strength at high speeds, i.e., power (Kraemer et al., 1995). It has also been reported that highly trained athletes in particular may be susceptible to the interference effects of combined strength and endurance training (Kraemer & Nindl, 1998; Sale, MacDougall, Jacobs, & Garner, 1990; Tan, 1999), especially when large volumes of strength and endurance training are combined over extended time periods (Kraemer & Nindl, 1998; Kraemer et al., 1995; Sale et al., 1990; Tan, 1999; Volpe, Walberg-Rankin, Rodman, & Sebolt, 1993). At the same time, maintenance endurance training does not appear to interfere with strength training (Hunter, Demment, & Miller, 1987). In addition, interference between strength and endurance training seems to only occur when both modes of training engage the same muscles (Hennessy & Watson, 1994; Hunter et al., 1987; Kraemer et al., 1995).

Physical Conditioning and Technique Training

The second instance of interference commonly reported is between physical conditioning in general and technical training. In particular, high volumes of physical conditioning training are thought to interfere with the quality of technical training (Charniga et al., 1986b; Holmes, 1999; Siff & Verkhoshansky, 1996; Tschiene, 1993; Tschiene, 1995; Verhoshansky, 1996; Verhoshansky et al., 1991; Verkhoshansky, 1985/1988; Viru, 1990).

Siff and Verkhoshansky (1996) claim that technical mastery can only be acquired when the athlete is in a high state of special physical preparedness. Consequently, it is very important that the athlete is fresh and able to perform to his utmost ability during technical training. However, as will be discussed shortly, the concentration of conditioning loads used in unidirectional training leads to a temporary reduction of the specific performance

capacity. This fatigue, in turn, can hamper effective technical training.

Conjugate Sequencing

The second aspect of synergy important for the design of the annual plan is a concept that Verkhoshansky (1985/1988) introduced as “conjugate sequencing” (p. viii). Conjugate sequencing refers to how training methods of different primary emphasis are arranged chronologically in the annual plan. Three points of conjugate sequence theory are of particular importance.

Progression in the Training Potential of the Loading

The first point refers to the idea that the training means of increasing training potential and specialization should be introduced into the program as the athlete becomes fitter. This is essentially a re-statement of the Principle of Load Progression. The training potential of a particular training method decreases as the athlete adapts to it. Eventually, the training potential will be so low relative to the athlete’s fitness that it becomes insufficient to stimulate a positive training effect. Therefore, it is important that exercises of increasing training potential - but of the same primary emphasis - are sequentially introduced into training during any one particular period (Brunner & Tabachnik, 1990; Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988).

Proper Sequencing of the Training of Different Primary Emphasis

The second aspect of conjugate sequencing refers to how blocks of training with different primary emphases (e.g., training for maximum strength and aerobic endurance) are sequenced in the annual plan. As stated previously, attainment of a cumulative training effect is the primary consideration in planning, according to the Exercise

Physiology Model. Hence, when employing a unidirectional organization, you have to carefully plan the yearly training so that all of the major block periods sequentially build upon each other (Brunner & Tabachnik, 1990). Siff and Verkhoshansky (1996) believe that complexness should be understood in terms of the succession of unidirectional training loads over time, not in parallel. Viewed this way, the conjugate sequence method not only preserves the advantage of complex training, but also provides a more powerful stimulus for adaptation.

Verkhoshansky also warns that conjugate sequencing is only effective if the training effect of the previous work has become relatively stable (i.e., blocks of unidirectional training should typically last no less than four to six weeks) (Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988).

Exploitation of the Long-Term Lagging of the Training Effect

The third important point about conjugate sequencing is based on a phenomenon in adaptation arising as a result of the use of concentrated, unidirectional training. The use of concentrated loads for a period of time leads to a prolonged disturbance in homeostasis accompanied by a decline in performance capabilities. In the overtraining literature, this is often referred to as “overreaching” (Fry, 1998, p. 109). While overreaching results in a temporary decline in the special work capacity, it is thought that it also provides a powerful stimulus for adaptation. Consequently, when the volume of training is reduced and the body is allowed to regenerate, there is a sharp increase in the special work capacity (Banister et al., 1999; Chernyak, Karimov, & Butinchinov, 1980; Maglischo, 1993; Rowbottom et al., 1998; Siff &

Verkhoshansky, 1996; Stone & Fry, 1998; Verhoshansky, 1996; Verkhoshansky, 1985/1988). This supercompensation in sporting form has been termed the “long term lagging of the training effect” (Verkhoshansky, 1985/1988, p. v) (LLTE).

According to the Exercise Physiology Model, there are two cases in which the LLTE should be exploited in the annual plan. For one, it is thought that the effectiveness of technique training can be significantly enhanced when it is completed against the background of the LLTE (Brunner & Tabachnik, 1990; Siff & Verkhoshansky, 1996; Verhoshansky, 1995; Verhoshansky, 1996; Verkhoshansky, 1996; Verkhoshansky & Lazarev, 1989). Second, the LLTE should be timed for the period of the major competitions.

The Large Training Cycle

The Exercise Physiology Model proposes that the annual plan should be structured in a manner corresponding to the complete phase of the development of the LLTE. One such cycle is referred to as a “large training cycle” (Verkhoshansky, 1996, p. 2). Three stages of the large training cycle can be identified.

The Preparatory Stage

In the preparatory stage, the use of concentrated, unidirectional, SP loads leads to a temporary reduction of the specific performance capacity. This concentrated loading constitutes a relatively independent block of training whose purpose is to both create the functional foundation for technical training and stimulate the LLTE (Siff & Verkhoshansky, 1996).

The Recovery Stage

Many coaches and athletes make the mistake of not balancing the high load preparatory stage with a full restoration period (Brunner & Tabachnik, 1990; Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988). If this happens, the body is forced to overextend itself, resulting in a lowered, and possibly negative, cumulative training effect (Siff & Verkhoshansky, 1996). Therefore, it is recommended to include a period of recovery to enhance the LLTE.

The Stage of the LLTE

After an appropriate recovery stage, the body responds with an increased motor potential. Technical work and/or competition are then performed against the background of the LLTE (Verhoshansky, Mironenko, Antonova, & Hachatarian, 1992). According to Verkhoshansky (Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988), the body responds well to intensive loading during this period, but reacts negatively to high volume work. Therefore technical training is completed at a reduced volume with moderate to near maximal intensity (Verhoshansky, 1996; Verhoshansky et al., 1992).

The Division of the Macrocycle into Large Training Cycles

Similar to the Classical Model, the structure of the macrocycle according to the Exercise Physiology Model is oriented towards the dates of the main competitions. However, the biological aspect takes precedence in training. Tschiene (1995) explained that “it is a question of a directed adaptation of the athlete to the specific conditions of his expected performance” (p. 14).

According to Verhoshansky et al. (1991), a single concentrated SP load does not fully exploit the athlete’s

CAR and does not stabilize the new functional level. Therefore, it is recommended that two large training cycles are included in a macrocycle to obtain a stronger,

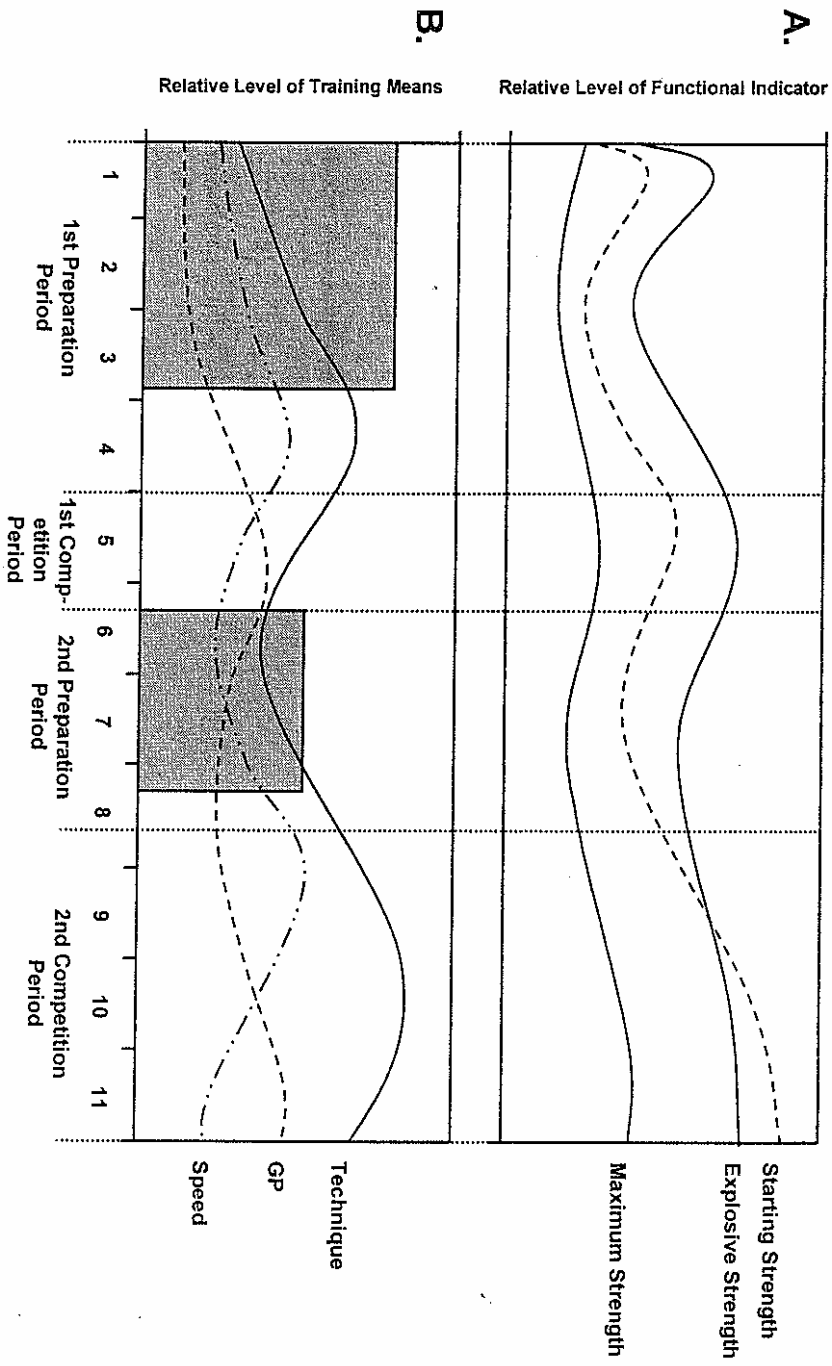

Figure 5.2. A model for the construction of the annual plan for sports requiring explosive effort. The shaded blocks represent the stages of concentrated special strength preparation to promote the LLTE. Graphic A shows the trend in functional indicators. Graphic B demonstrates the distribution of training means. Modified from Siff and Verkhoshansky (1996).

more stable training effect (Figure 5.2) (Siff & Verkhoshansky, 1996; Verhoshansky et al., 1991). Verhoshansky (1996) wrote that the first block of unidirectional SP should coincide with the start of the preparation period to prepare the athlete for a block of technical training. The second should be timed with the end of the preparation period to prepare the athlete for competition. Each macrocycle should end with a recovery phase, the length of which is determined by the stress of the competition period (Tschiene, 1993).

The use of concentrated, unidirectional loading for exploiting the LLTE has been established for speed strength sports, sprinting, hurdling, middle distance running, and jumping (Mikhailov & Minchenko, 1988; Verhoshansky, 1993; Verhoshansky, 1995).

Interestingly, proponents of the Exercise Physiology Model do not reject the Classical Model entirely[8]. Rather, they believe that the Classical Model is valid only for athletes in the early training stages (Bondarchuk, 1988; Brunner & Tabachnik, 1990; Gambetta, 1989; Gambetta, 1991; Stein, 1998; Verhoshansky, 1993; Verhoshansky, 1995). It may be that the Classical Model, with it's focus on multi-lateral development and GP, is appropriate for young, developing athletes. At some point in the athlete's development, however, the Classical Model becomes inadequate – the volume-oriented focus violates the Principle of Moderation and leads to overtraining, and the use of distributed, complex training is of insufficient training potential to stimulate adaptation. At this point, a more effective organization of training is needed and the switch should be made to the Exercise Physiology Model.

[8] It should be noted however, that recent articles published on the Exercise Physiology Model seem to be more critical of the Classical Model than previous ones.

5.5 Criticism of the Exercise Physiology Model

The Exercise Physiology Model has also received some criticism in the literature. A number of important considerations have been brought up.

Biology is Only One Aspect of Preparation

Matveyev claims that the theory of adaptation upon which the Exercise Physiology Model is based is only one of the many components in the preparation of highly qualified athletes (Matveyev, 1993). While he admits that adaptation plays a significant part in producing changes in the organism, he proposes that the complete development of an athlete is not limited to achieving only an adaptation effect. Rather, the continuous development of all individual abilities, and not the theory of adaptation, is the key factor to be considered in training planning (Matveyev, 1993; Matveyev, 1994).

Unidirectional Training Leads to Monotony

Critics have also pointed out that unidirectional training results in training monotony and consequently to a dulling of the training effect. Proponents of the Exercise Physiology Model counter this point by emphasizing that a variety of training means of the same primary emphasis should be used in unidirectional training (Brunner & Tabachnik, 1990; Siff & Verkhoshansky, 1996; Verkhoshansky, 1985/1988). In addition, means of increasing training potential should be sequentially introduced during a block of unidirectional training (See Progression in the Training Potential of the Loading, p. 95).

The Risk of Overtraining

Although overreaching is considered a vital part of training for highly qualified athletes, there is a fine line between overreaching and overtraining which is easily crossed (Budgett, 1998; Fry et al., 1992a; Kraemer & Nindl, 1998; Mackinnon & Hooper, 1992). Relatively little is known about this transition although the consequences of overtraining are severe. Moreover, the problem of balancing on the fringe between overreaching and overtraining is a complicated task for the coach as the tolerance of training loads varies from individual to individual (Budgett, 1998); What may be too much for one athlete may be insufficient for another. Complicating things even further is the fact that an individual athlete's capacity to tolerate training loads varies over the training year depending on his level of health and fitness (Budgett, 1998). Verkhoshasnky says that the inherent risk of overtraining and injury associated with this model stresses the importance of knowing how to use this method properly and when it may be appropriate to use (Siff & Verkhoshansky, 1996).

CHAPTER 6. TECHNIQUE TRAINING

6.1 Introduction

Technique is undoubtedly one of the primary factors determining performance in alpine ski racing. This can easily be seen from the sheer number of publications addressing the topic. However, despite this importance in skiing – as well as in other sports – the training of technique is a relatively weak area in training theory (Martin, 1992; Martin & Lehnertz, 1989; Mechling & Roth, 1992)

The purpose of this chapter is to present a summary of the practical theories on technique training found in the training theory literature. Discussion of the underlying motor learning models is beyond the scope of this thesis and will be held to a minimum. What is of particular interest here is how technique training is progressed from the initial stages of learning a new skill – or modifying an old one – to the final preparations for competition. Although this chapter will focus more on the general trends of technique training than on the training methods, some discussion of methods will be natural.

This chapter is divided into two primary sections. In the first, what might be considered the traditional model of technical training is presented. Thereafter, some of the critique of this model is reviewed.

6.2 The Traditional Model of Technique Training

Although there are small differences in terminology, the majority of the literature that addresses the training of technique in practical terms seems to outline rather similar philosophies. In this section, I have tried to summarize the main, consistent points made in the literature.

Put simply, the process of training a new skill – or modifying a previously learned one - described in the literature seems to be one where a skill is first learned, then automated in standard conditions, and finally stabilized to disturbing factors. Each of these phases is presented here.

Initial Learning of the Skill

The initial learning of a skill is often seen as a particularly important phase of technique training. There are two primary goals to be achieved during this phase. First, it is critical to success that the athlete is motivated to learn (Christina, 1988; Harre, 1982a; Major & Svendsen, 1995; Schmidt, 1999; Stein, 1998; Aamodt, 1999). Thus, an important task to undertake at the beginning of training is to convince the athlete of the importance of learning – or modifying - the skill.

The second goal is to give the athlete a general idea of the task to be learned (Christina, 1988; Schmidt, 1999). To do this, it is often necessary to create favorable conditions for the proper execution of the skill. Measures taken to do so typically include ensuring that the athlete is physically and psychologically well-rested and creating a training environment that facilitates concentration and focus (Major & Svendsen, 1995; Schröder et al., 1982). By the end of this phase, the athlete should be able to successfully execute a basic form of the

skill in standard, favorable conditions (Dick, 1997; Schröder et al., 1982).

Technique Acquisition Training: Automation

After initial learning, the skill is “automated.” This means that a skill is practiced to the point where the athlete no longer needs to direct conscious attention to the action (Abernethy, Wann, & Parks, 1998; Christina & Corcos, 1988; Major & Svendsen, 1995). Three important aspects of this type of training are the need for a large number of repetitions in standard conditions; the importance of success; and the importance of intensity.

The Method of Standard and Repeated Exercise

To automate a skill, it is thought that a great number of repetitions are necessary (Bompa, 1994; Major & Svendsen, 1995; Martin, 1992; Matveyev, 1977/1981; Rushall, 1997). Moreover, it is thought that to successfully automate a skill, deviations from the ideal movement should be minimized from repetition to repetition. This means that the conditions of training should be as similar as possible from repetition to repetition and the training environment should be free of disturbances. Due to the high number of repetitions and the standard conditions, the primary method used in technique acquisition training is referred to as the “method of standard and repeated exercise” (Matveyev, 1977/1981) and “overlearning” (Martin, 1992)

The Principle of Progression: The Importance of Success

The principle of progression simply states that training should progress from easy tasks to more challenging. At the same time, it is important that technique training is characterized by a certain degree of success so that errors are not automated (Christina, 1996; Dick, 1997;

Martin, 1992; Matveyev, 1977/1981; Schröder et al., 1982). This means the training situation should be adjusted according to the skill level of the athlete such that a positive character of automation is maintained. This should include limiting fatigue (Bompa, 1994; Fry et al., 1992b; Martin, 1992; Matveyev, 1977/1981; Schiffer, 1987; Schröder et al., 1982; Siff & Verkhoshansky, 1996).

The Principle of Specificity: Maintain a High Intensity

It is believed that skills automated using a low intensity do not transfer well to the high intensity situations typical of competition (Major & Svendsen, 1995; Siff & Verkhoshansky, 1996; Stein, 1998; Tschiene, 1993; Witteveen, 1997). In alpine ski racing in particular, it is thought that technique at high speeds is different from that at low speeds (Petrovic, Belehar, & Petrovic, 1989; Witteveen, 1997):

> *"We were not aware of the significance of speed and treated faulty technique at greater speeds as a mistake, and not as the learning of a completely new program." (Petrovic et al., 1989, p. 12)*

Thus, it is important that a high level of intensity is maintained in training, even at this early stage. At the same time, the intensity should not exceed the athlete's ability to successfully complete the task (Matveyev, 1977/1981).

In the alpine ski racing literature it is believed that the training conditions should be designed such that the athlete skis aggressively, searching for speed (Müller, 1984; Witteveen, 1997). If the terrain is too difficult, or if there are not adequate safety measures in place, the athlete will not ski with a high intensity. This, in turn, can lead to the development of a defensive, static technique where the athlete is more concerned with

controlling speed than actively searching for speed (Witteveen, 1997).

Technique Application Training: Stabilization

After a skill is automated in standard conditions, it is important to stabilize the technique such that it can be successfully applied under the variety of conditions that characterize competition in the given sport (Abernethy, 1991; Martin, 1992; Ramlow, 1989; Schröder et al., 1982). Thus, one of the primary characteristics of this stage is a large variety in training conditions. This includes varying the training situation (in terms of alpine skiing, the course set, the terrain, and the snow conditions), the weather, the equipment, and the living conditions (Major & Svendsen, 1995). Petrovic (1989) suggests that one should also vary the speed of the skier.

Over the course of this stage, the physical and psychological demands of the training situation should progressively become more challenging. This should include training under fatigued conditions (Martin, 1992; Matveyev, 1977/1981; Olivier & Dillinger, 1998; Schröder et al., 1982). In this way, technical training is carried out in unity with the training of specific endurance (Matveyev, 1977/1981). At the same time, the degree of challenge should not be so great as to distort the skills being stabilized.

Competition Training

The last phase of training consists of the final preparations for competition. It is important that this training models the competition situation as closely as possible:

> *"Learning and practicing skills and techniques in the 'artificial' environment of practice is*

> *important to solidify skills and responses. But asking an athlete to perform the same skill or use the identical strategy in a situation that is unrelated to how it was learned and practiced is like requiring the player to perform a skill he/she has never learned or practiced in the first place." (Anshel, 1988, p. 7)*

The training situation should model competition conditions as completely as possible in terms of the techniques used, the time schedule of events, and the external conditions (Matveyev, 1977/1981). Christina (1996) pointed out that psychological components should also be modeled. According to Schiffer (1987), this inlcudes the following three aspects: (a) uniqueness of the action; (b) fixed time when the action is carried out; and (c) consequence of the action. Matveyev (1977/1981) suggests using strategies to increase the psychological stress experienced by the athletes such as suddenly postponing a previously planned training competition for a day.

Technical Supplementary Training

Martin (1992) identifies a fifth type of technique training that plays a more supplementary role. He feels that in sports with a large technical component, such as alpine ski racing, training of specific skills alone is not sufficient to achieve technical mastery. Müller (1984) suggests that the precision of our technique is closely related with the effectiveness of our senses. Hence, technique training should be supplemented by activities directed at the development of the kinesthetic senses such as dance and ballet, specific flexibility training, and imitation training.

6.3 Critique of the Traditional Model

It is worthy to note that while the above described model is typical of the training theory literature, not all authors in the alpine ski racing literature or the motor learning literature agree with it entirely. The difference of opinion – in practical terms - primarily centers on the use of variety in training. Namely, some authors disagree with the use of a prolonged period of training with a large number of repetitions under standardized conditions (i.e., the method of standard and repeated exercise used in the automation of skills). Instead, these authors believe that variety should be included in training right from the very beginning. There are two different perspectives of why this is so.

The Motor Learning Perspective: Contextual Interference

First, it is well established in the motor learning literature that the conditions which optimize the athlete's performance in training are not necessarily the most effective for long-term learning (Schmidt, 1999). In fact, it seems that disturbing factors, such as having to slightly vary the execution of the skill from repetition to repetition, benefits in greater learning. This phenomenon, termed contextual interference, has important implications for the training of technique. Namely, it is more effective for learning to train tasks under variable than standardized conditions (Christina, 1996; Schmidt, 1999). Schmidt (1999) concludes that:

> *"The 'traditional' methods of continuous drill on a particular action (i.e., practicing one skill repeatedly until it is correct) are probably not the most effective way to learn. Rather, the evidence suggests that practicing a number of tasks in some nearly randomized order will be the most successful means of achieving the goal of stable learning and retention" (p. 311).*

The Sport-Specific Perspective: Technique Is Seen as Adaptation Rather than Application

Second, a certain group of authors in the skiing specific literature (Major & Svendsen, 1995; Müller, 1981; Müller, 1984) suggest another – perhaps related - reason for why variety is important in technique training. In 1984, Müller wrote an interesting article where he differentiated two views of technique.

One view characterizes technique as an ideal movement pattern as demonstrated by a representative sample of successful racers. According to this perspective, technique consists of a precise set of movements that should be learned and then applied in competitive situations despite disturbing factors. A practical consequence of this view is that skills should be automated using a large number of repetitions. Any factors that might cause a deviation from the ideal movement are seen as problems that interfere with learning of the technique. Hence, it is believed that automation of skills should occur under standard conditions free of disturbing factors. Once automated, skills should be stabilized to the challenges that the competitive environment will pose. This is similar to the traditional model as described earlier. Müller feels that this perspective of technique has had too much of a priority in alpine ski racing:

> *”It is my opinion that this view of technique, as an ideal movement pattern with more or less precisely analyzed parameters, has been allowed to dominate the concept of technique to too great of an extent. This side of the subject is also important, and must have its place. But when this interpretation stands alone as a kind of ‘superstructure’ over the concept ‘technique,’ it has an unfortunate consequence on training ...” (p. 8)*

He suggests further that the method of standard and repeated exercise associated with automation may have a retarding effect on the capacity to change and adapt. As an alternative, Müller proposes a second perspective which views technique as the skier's capacity to adapt to a changing environment in order to achieve a specific effect. Thus, rather than applying a precise set of movements, technique is seen as the athletes ability to change his movements according to the environment to achieve a desired effect. The actual movements used to obtain this effect are secondary in importance to the end result.

Similar to the motor learning view, the practical consequence of this perspective is that variety should be included in the athlete's training from the very beginning. To stimulate the racer's ability to react to the environment and appropriately adapt their technique, Müller suggests using contrast situations in training. For instance, one might perform the same tasks immediately after each other but in very different external conditions (i.e., different snow or terrain). Another idea could be to practice in situations that immediately vary between technical solutions to achieve the same effect – for instance, different techniques of unweighting between turns. These are training methods geared towards stimulating the athlete's capacity to adapt to the situation.

PART 3. THE COACH'S PERSPECTIVE: RESULTS AND DISCUSSION OF THE INTERVIEW STUDY

In the following chapters, the perspective of the interviewed coaches is discussed. In Appendix D, a schematic showing the organization and relationships of the decision classes, categories, and sub categories[9] is presented. The figure is divided into two halves, one each for the preparation period and the competition period. This separation is important as it represents what I feel – on the basis of the interviews - to be almost two different planning models for the preparation and competition periods.

For the preparation period four classes were defined: the planning of on snow training; the planning of dryland training; the planning of recovery; and the planning of equipment testing. Similarly, four classes were defined for the competition period: the planning of competition; the planning of on snow training; the planning of dryland training; and the planning of recovery. One final class,

[9] For definitions of decision classes, categories, and sub categories, refer to Chapter 3, p. 32.

the timing of sporting form, was also defined. In the following chapters, each of the nine classes of decision categories is presented.

CHAPTER 7. THE PLANNING OF ON SNOW TRAINING IN THE PREPARATION PERIOD

7.1 Introduction

Based on the interviews, one of the most important aspects of the annual plan is that of the on snow, or technique training in the preparation period. Just by looking at the relative length of this chapter, it is clear that a substantial portion of the interviews was centered on this topic.

On the basis of the interviews, four aspects of on snow training that must be coordinated in the annual plan were identified. In the following four sections of this chapter, each of these aspects is presented as a decision category. In the first section, entitled A Description of The Contents of the On Snow Training, some characteristics of the on snow training methods which have important implications for the design of the annual plan are introduced. Factors considered by coaches in determining the location of training camps are presented in the second section, Determining the Location of On Snow Training. Under Determining the Volume of On Snow Training, some variables that coaches consider in deciding the total volume of training for the preparation period are discussed. Finally, how coaches determine when to plan technique training over the course of the preparation

period is presented under the last section, Determining the Structure of On Snow Training.

7.2 A Description of the Contents of the On Snow Training

The first decision category under the planning of on snow training is termed the contents of on snow training. This refers to the various training methods that are used in the development of skiing technique. Although no decision variables were identified for this category, the various aspects of technique training described here have important implications for the design of the annual plan. These will be addressed again as decision variables in later sections of this report. In the following section of this chapter, the phases of technique training as described by the interviewed coaches are presented. Then, an additional point emphasized during the interviews, the importance of a high quality and effectiveness in technical training, is discussed.

The Phases of Technique Training

Three different phases of technique training were identified on the basis of the interviews: (1) technique drill training, (2) technique adaptation training, and (3) competition preparation training.

Technique Drill Training: “Getting Things Going On Upstairs”

Technique drill training refers to the initial learning of a new skill or modification of an older skill. According to the interviewed coaches, one of the primary goals of technique drill training is for the athletes to become familiar with and understand the new skill – both in a theoretical and motoric sense. Accomplishing this task lays the foundation for further technique training during

the preparation period. Some words used by the interviewed coaches to describe technique drill training included: “exaggerate”, “get the things going upstairs”, “learn a new movement”, “basic skills”, “balance”, “fundamental work”, and “elements.” Based on the interviews, four important points regarding this phase of training were identified.

The Athletes Have to Be Motivated to Learn

First, the interviewed coaches believe that it is important that the athletes are highly motivated to learn, similar to the literature (Christina, 1988; Major & Svendsen, 1995; Schmidt, 1999; Schröder et al., 1982; Stein, 1998; Aamodt, 1999). An important aspect of this, according to the coaches, is for the athletes to believe that the intended modifications in their technique are important to their further development as alpine ski racers. As one coach indicated, this stage can be especially important since mature, highly experienced athletes may be initially reluctant to change a technique that has previously given them success:

> *“You have to understand the athletes, too. They are a little bit protective about themselves. They are not going to buy everything that you are going to say. So, you are going to need a little bit of time for them to buy into it. You are going to need a little bit of time for them to understand it. And you are going to need a little bit of time to get on the same track. So, usually we use the first camp, March/April or late April, to kind of get everybody to focus on one thing. This is what we are going to work on. And then the next camp you start working on it.”*

Establish a Means of Communication

An important aspect of technique training is effective communication between the athlete and coach. Oftentimes

however, much of the terminology used can be unclear and subject to multiple interpretations. Moreover, during on snow training the communication between athletes and coaches can be difficult due to the fact that a substantial portion of it takes place over radios where there is no face-to-face contact. Any terminology that is ambiguous can quickly lead to confusion and misunderstandings between the coach and the athlete. Thus, an important goal of technique drill training, according to the interviewed coaches, is the creation of a standard and common vocabulary to be used in communicating about the new technical goals of the season.

The Importance of Success

According to the interviewed coaches, the degree of success in accomplishing the training tasks is a critical factor in determining the selection of training methods in technique drill training, in agreement with the literature (Christina, 1996; Martin, 1992; Matveyev, 1977/1981; Schröder et al., 1982). As one coach indicated, if the athlete cannot succeed in accomplishing the task it is not likely that he will establish an understanding of the new skill. Consequently, the training environment in technique drill training is often set up in such a manner that facilitates successful execution of the technical skills:

> *"We have a goal for each session. And then we try to make the training course in this direction that they can reach the goal easier."*

To do this the coach needs to be aware of the various aspects of the training environment that he can control by choosing. For example, a variety of options are available to the coach when deciding the type of course to set, including the turn radius and rhythm. Training courses in

this period are typically shorter and of a relatively even rhythm. If a long slope is available, then courses are split into sections when possible. In so doing, the negative effects of fatigue on the execution of the skill are reduced, an important factor to consider according to the literature (Bompa, 1994; Martin, 1992; Matveyev, 1977/1981; Schiffer, 1987; Schröder et al., 1982). Additionally, the terrain in the slope may be built up in such a way to assist the athletes in achieving the desired movements. Competition pressure, such as that caused by timing, and other interference variables are, for the most part, reduced so that the athlete can focus more fully on the task at hand.

The Importance of Intensity: Developing an Attacking Technique

Although the environment in technique drill training is set up to make the tasks relatively easier for the athletes, this does not mean that the intensity of execution is low. To the contrary, the ski coaches emphasized that it is critical to maintain a relatively high intensity in training, even at this early stage:

> *"When we work in the drill phase, we don't go down in intensity. We try to keep the intensity high. For sure, we can't do so many runs as we want because of this intensity, but we think that it is the right way to develop technique. To be a 100% technique. We do not want to develop a 60% technique."*

The importance of intensity in early periods of technique training is also emphasized in the literature (Major & Svendsen, 1995; Petrovic et al., 1989; Siff & Verkhoshansky, 1996; Stein, 1998; Tschiene, 1993)

The combination of both the importance of success and the importance of intensity in technique drill training has

implications for the type of terrain that should be selected and the type of course that should be set. If the outer conditions are too difficult for an athlete, he will not have the chance to ski aggressively and yet remain focused on the technical task at hand. The interviewed coaches seemed to agree with Müller (1984) and Witteveen (1997) that such circumstances could potentially lead to the development of a "defensive" technique instead of an "attacking" or "aggressive" technique. Thus, as one coach hinted, the terrain in technique drill training should be one in which the athlete is comfortable enough that he can ski aggressively, yet still be able to focus on the technical aspect of the task:

> *"When you want to learn, you go on a beginner slope ... for ski racers, on an easier hill where you can control the speed. Like where the steepness of the slope does not make you go faster and faster all the time. Where you can gain a specific amount of speed and then you stay there and you can play around."*

Technique drill training can be thought of as comprising the first two phases of the traditional model (see p. 106) – i.e., initial learning and technique acquisition training. However, there is an important difference between technique drill training as described during the interviews and technique acquisition training as described in the literature. The primary method of technique acquisition training is the method of standard and repeated exercise, the goal of which is to automate a skill to the point that it can be performed in standard conditions despite disturbances (Martin, 1992; Matveyev, 1977/1981). Although the interviewed coaches did use the expression "automation," they did not describe using a prolonged period of repetition in highly standardized conditions. Rather, it seems that technique drill

training is a relatively short phase where the primary goal is to introduce the new skill (or modification) so that the athlete knows what successful execution of the skill feels like. At that point, emphasis is placed on learning to adapt the skill to varying outer conditions. This seems to support Müller's (1984) critique of the traditional model of training.

Technique Adaptation Training: The Importance of Systematic Variation

While coaches strive to create situations that facilitate performance during technique drill training, during technique adaptation training they start to introduce various forms of challenge to which the athletes must adapt their technique. Courses are set with varying rhythm and turn radii. Training is completed on different types of terrain and, if possible, different types of snow condition. Basically, the coach tries to cover all the situations that the athlete might face in competition.

One practical difficulty faced in achieving variety is that this stage of training is commonly completed during the summer and early Fall months. At this time, snow conditions are normally at their worst levels, at least in the Northern Hemisphere, and the possibility for creating variety is often very limited. This places a great demand on the creativity of coaches to generate the variety needed to further stimulate their racers. In the following quotes, two of the ski coaches pointed out how they are able to create variety in training despite these circumstances:

> *"From day to day we try to have courses in different places. We build terrain into the course. We can let the course stay from one day to another so that it is bumpy as hell. If we have two sessions, we always make a new course after the first session."*

“... We make two runs in the first course. Then we have another course on another slope with two runs. So, we try to get variety ... We can start in the morning with two sections and then we go to timing full length on a steeper part. And then we might have timing on a flat.”

In addition to the inclusion of variety, technique adaptation training steadily progresses in terms of the challenge demanded of the athletes. The degree of difficulty is varied from day to day, session to session, and even within one session. Some sessions are relatively easy for the athlete to build up his confidence and to allow him to execute the desired skills successfully and aggressively. Other sessions are more difficult to push the limits of the racer’s abilities.

Competition Preparation Training: “Training Your Heart of Competition”

Eventually, training is progressed from technique adaptation training into the final phase, competition preparation training. At this stage, the technical, physical, and psychological aspects of preparation merge and are trained together in situations simulating competition.

From the technical perspective, the athletes endeavor to bring their newly formed skills to the highest level of mastery under the pressures and constraints of a simulated competition situation. An important aspect of this is assuring that the athlete has confidence in his abilities and in his equipment in the more challenging snow conditions that he will encounter during the competition period:

“You try to get three to four days on pure ice. You need to kind of get a check. You need to kind of check the equipment and check that the confidence is there in tough conditions. That is what is really important to do in November ... I

> *mean, I am talking hockey rink. So that you feel that your skis are going to hold. That the equipment is there."*

From the physical standpoint, the primary goal is to establish the specific muscular endurance needed for alpine ski racing. To achieve this, it is essential to train full-length, demanding courses. This requires access to longer ski slopes, which fortunately become available again in early November.

From the psychological perspective, one task of competition preparation training is to develop the athlete's confidence and motivation coming into the competition period. Many of the ski coaches described how critical it is that the athletes are confident in their preparation and hungry to race.

Another important task from the psychological perspective is to develop what Matveyev (1977/1981) termed, "immunity to interference" (p. 132). This includes, for example, learning how to perform under the increased pressure characteristic of competition situations. For example, during much of the preparation period, athletes have multiple opportunities to perform a skill in any one training session. However, in competitions, athletes are required to perform skills with little or no prior practice. The interviewed coaches felt that it was important for athletes to experience this increased pressure in the final phase of training.

A variety of methods are used in training to increase the psychological pressure experienced by the athletes including, for example, limiting the number of training

runs, posting training race results publicly, and cross nation training.[10]

> *"You can say to one racer, 'OK, today, the other guys ski five runs. You ski two runs. And you have to be the best in these two runs,' or something like that. You put the pressure on them. They don't get to ski much, like in a race. They have warming up and then full blast. We are pushing the racer to do exactly what they should do in a competition."*

In addition to learning how to deal with increased pressure, it is important that the athletes develop their routines for preparing themselves to compete. In this regard, simulating the time schedule of competitions (e.g., fixed times for warm-up runs, inspections, start times, and so on) is important. Some of the interviewed coaches described how one of the most challenging tasks for athletes in the competition period is dealing with the uncertainty of the time schedule which arises as a result of changes in the weather and snow conditions. For instance, during a downhill competition, it is not uncommon for prolonged, unexpected pauses in the competition to take place due to temporary reductions in visibility. Such uncertainties are a part of the sport of alpine ski racing and the athletes must learn to adapt their pre-race routines in such a way that they can maintain their focus under these circumstances. Therefore, randomly simulating postponed start times and course holds is another, realistic way to increase the pressure experienced by the athletes in competition preparation training.

Competition preparation training is usually both highly individualized and focused on quality. As one coach

[10] Cross nation training refers to training together with athletes from other nations. This is also referred to as "matching."

described in the following quote, they try to keep the athletes well rested and motivated to ski fast:

> *"Here [November] we try to do it very individualized. We have some skiers on the hill everyday. But you give people a lot of rest. Like if you do two slalom sessions, the athletes can choose between sessions. Try to keep them really fresh all the time. But it is very much focused on quality and that they are well prepared for when they are in the start gate ... that they really want to ski fast."*

The Importance of Maximizing the Quality and Effectiveness of On Snow Training

One aspect of the contents of the on snow training which all of the coaches described as influencing almost every aspect of structuring the training year was that of maximizing the quality and effectiveness of the on snow training. In the sport of alpine ski racing, the amount of time available to specific technique training is limited due to environmental constraints. It is therefore critical that the time available is of the highest quality and productiveness. Anything less is viewed as a waste of both time and energy. In connection with the contents of on snow training, the interviewed coaches identified three tasks a coach should carry out to enhance the quality and effectiveness of on snow training: (1) Establish Clear Technical Goals, (2) Create Variety in Training, and (3) Keep Training Fun.

Establish Clear Technical Goals

According to the interviewed coaches, clear goal setting is an essential aspect of assuring the productivity of technical training. Having a clear picture of the year-long technical development of an athlete provides the basis for the planning of the on snow training in the

preparation period. In this connection, it is important not to spread things out too thin, but rather, to narrow the technical goals down to two to three major points each year. It is then important to clearly identify the specific tasks to be accomplished in each period of training to attain these goals:

> *"What I endeavor to do with the training that I plan for athletes is to have a very specific focus on each day. A very specific focus in each situation. Specific things that are trying to be accomplished. Goals for each day, goals for each week, goals for each camp, goals for each period and so forth. And I think that that type of goal setting is extremely important both for the coaching staff and to the athlete in terms of maximizing their utilization of training."*

Create Variety in Training

In addition to being an important aspect in developing an athlete's technical adaptability, variety in the contents of training can help maintain the athlete's motivation - and thereby productivity - in training. One important way to increase variety for this purpose is to train in all of the four disciplines regardless of the athlete's specialization. One of the ski coaches described this in the following way:

> *"One of the most difficult things that I find with national team athletes is keeping them interested ... keeping them excited during the whole preparation period. Keeping them motivated to make improvements and to make change. I think that the majority of athletes that I have been involved with at that level would really just put in the time at the first camps, and then, as the season begins to get a little bit closer, their interest picks up more and more."*

Due to the environmental conditions associated with the changing of the seasons, alpine ski racing has a rather long off-season (preparation) period. This particular coach experienced difficulties motivating athletes in the early preparation period when the first competitions seem so far away. He felt that by training in events that were different than the athlete's specialty that the athlete's level of interest and motivation could be maintained at a higher level.

Keep Training Fun

Part of keeping on snow training productive is to keep things fun and interesting for the athletes. Training needs to be organized and quickly moving.

> *"We have never been successful unless the guys were having a lot of fun ... Unless it was really a sport and it was always a fun sport. And that is really hard to keep instilled. Often times it becomes so serious that it becomes work and it is ridiculus. And no one does well. As long as it is a sport and you keep the sport in it, and the enjoyment is brought out of the sport, then you have a great chance to do really well. If it is work, and you are working hard for results ... no chance. No chance. It cannot be results-oriented. It has to be enjoyment-oriented. You have to love skiing fast. And the training has to be a lot of fun."*

In summary, three primary phases of technical training were identified from the interviews. In the first phase, technique drill training, the goal is for the athlete to obtain a theoretical and motoric understanding of the correct execution of the skill. The importance of success and the importance of intensity during this period have implications for how the training environment should be designed.

During technique adaptation training, the second phase, the goal is to gain experience adapting one's technical skills to varying terrain, snow and course conditions that may arise in competition. Coaches shift from creating situations that facilitate successful execution of the technical tasks to challenging the athletes with gradually increasing difficulties. This is perhaps the phase where the majority of the technical training volume is spent in alpine ski racing due to the importance of being able to adapt one's technique to varying conditions.

In the final phase of on snow training, competition preparation training, the physical, mental and technical aspects of training are integrated as a whole. At this time, the athletes are challenged to execute their technical skills in competition situations with increased psychological and physical demands.

In addition, the coaches emphasized the importance of a high quality and effectiveness of on snow training. This importance plays a critical role in the design of the annual plan.

7.3 Determining the Location of On Snow Training Camps

A second decision category that coaches consider when planning the on snow training for the preparation period is where to have training camps. This decision is particularly important as camp locations play a significant role in determining the quality and effectiveness of the technical training. In choosing the location of on snow training camps, the interviewed coaches described five decision variables that are presented in Table 7.1. Each of these variables is discussed in this section.

The Goals of the On Snow Training and How These Correspond to the Training Possibilities at the Ski Area

One of the chief decision variables that is considered by coaches in selecting a training site is the available opportunity for training at the ski area and how well this corresponds to the goals of the technical training to be completed. In this connection, three factors are important to consider: The availability of adequate training space; the availability of adequate facilities and resources to prepare a high quality training arena; and the type of available terrain.

Available Training Space

In selecting training locations, it is important to consider how much training space is available at the different sites. This becomes more and more of a limitation in the late Summer and Fall when many clubs, regions, and development programs start to train:

> *"... if you do have conditions in the States, it is very crowded. You have a lot of people there. In the worst case scenario, you can ski one and a half hours per day. And you get a really narrow lane. But here [Norway] you can have a very ideal preparation. It is peace and quiet and you can do what you want."*

Possibilities for Preparing the Training Arena

Another factor that coaches consider is the possibility for preparing a productive training environment. This means that the area must have adequate facilities for preparing the slope for training including proper grooming of the slope, snow making facilities, possibilities for watering the hill, and proper safety equipment (e.g. netting, fencing, etc.).

Table 7.1. Decision variables associated with the decision category of the location of on snow training in the preparation period.

Decision Variables
• The Goals of the On Snow Training and How These Correspond to the Training Possibilities at the Ski Area ⇨ Available Training Space ⇨ Possibilities for Preparing the Training Arena ⇨ The Type of Terrain
• Constraints ⇨ Travel ⇨ Budget
• Tradition and Experience
• Psycho-Social Variables: The Importance of Maximizing the Quality and Effectiveness of On Snow Training ⇨ Variety in the Location ⇨ Compatability of the Location with the Athletes ⇨ Creating a Different Environment in Which to Focus ⇨ Proximity to Other National Teams
• Altitude ⇨ Altitude Affects the Quality and Effectiveness of Training ⇨ Acclimatization to Altitude

Ideally, training is done on winter-like snow to be most specific to the conditions that will be faced in competition. This is one reason why a number of coaches felt that it was important to have a training camp in the Southern Hemisphere during the Summer. At times when winter snow conditions are not available, it is important that the training slope can be properly prepared for training. For instance, snow conditions can deteriorate rapidly in warm weather and thereby severely limit the volume of productive training. To prevent this, certain chemical agents can be used to help keep the snow hard enough to allow training for a longer period of time. However, not all ski areas allow the use of such chemicals. This can be a significant factor in selecting a camp location, as one ski coach explained:

> *"The reason that we wanted to come here [Norway] was that in the Alps it is very warm. You cannot salt. And you might, if you are lucky, ski an hour in the morning where the conditions are acceptable, where it is good to ski. Here, you can salt. So, you can basically have good conditions the whole day through ... you can do a lot more intensive work than what you can do on soft snow ... We felt that with two weeks here you can do a lot more work than you can in the same amount of time in Switzerland."*

In addition, proper safety measures must be in place for high quality training. Not only does this provide a safe environment for the athletes, but it may also allow the athletes to ski more aggressively, as opposed to controlling their speed because of inadequate safety.

The Type of Terrain

Depending on the phase of the technical training and the time of year, different ski areas may be more or less

ideally suited as locations based on the available terrain for training.

As discussed previously, during technique drill training the external conditions are organized so that the racers are able to successfully accomplish the training tasks in an aggressive manner. For this type of training, ski areas that offer relatively easy terrain and snow conditions are preferred. Naturally, the higher the level of the athletes, the more challenging the conditions which can be chosen for these tasks.

On the other hand, with technique adaptation training, the goal is to gain experience adapting learned techniques to varying and progressively more difficult terrain and snow conditions. This has a couple of important implications for the selection of camp locations.

The first is that training camps throughout the year should vary a great deal in their location. Obviously, it would be much easier to prepare and maintain a high quality environment if all on snow training were completed at only one location for the entire preparation period. However, due to the importance of adaptability in alpine skiing technique, this is not an option, as one of the head coaches pointed out in his interview:

> *“I remember when the Austrian downhill team was so strong like ten to fifteen years ago. They spent the whole summer in Hintertux. The same glacier. They had the equipment in there. They left the skis. They did not move around, nothing. And the head coach’s approach there was just to make a lot of miles. Train and train and train. And then they were killing everyone [in competition]. It is so competitive now that you can not do that anymore. You need the variety. You need to move around.”*

The second implication is that it is particularly important to find ski areas that offer variety in the available terrain and snow conditions. Thus, finding a ski area that allows training on a number of different slopes is advantageous. Finding a group of ski areas which are relatively close to one another is also good in that training can be completed at two or even three different ski areas over the course of a single period of on snow training.

With competition preparation training, it is important to create a training environment that is as similar to the competition setting as possible - ideally this type of training is done on winter snow conditions. Moreover, hills which are similar to race sites in terms of terrain and length are desired. In addition, to set up quality competition preparation training requires a relatively large amount of hill space to be closed off, particularly for the speed events. Locations that can satisfy these demands are sought after for this type of training.

Constraints: Travel & Budget

In addition to the possibilities for preparing a good training environment, coaches must consider some constraints not directly associated with training when selecting a location. Two of these constraints that, as we will come to see, play a major role in many training decisions that coaches make are travel and budget.

The amount of travel an elite level alpine ski racer must undertake each year is extremely high. In fact, in one of the interviews a coach claimed that athletes at the World Cup level may spend on the order of 900 hours per year just travelling to and from training camps, races, and so forth. With the load of travel so high, coaches must balance the amount of travel with the quality of the

available training when selecting potential training sites. In some instances, this may mean that a coach forgoes training at a site with good training possibilities in favor of selecting a location with less travel.

Related to travel is the expense of training. To travel to some areas is obviously more expensive than to others. For most federations, budget is a limitation in selecting training sites.

Tradition and Experience

The tradition of the respective ski federations and the experience of the coaches are also factors used in determining the location of training camps. Over many years of organizing camps, the coaches of a ski federation learn where high quality training can be obtained. Additionally, specific contacts are often established at the various ski areas that are trusted to assist in creating high quality training environments. Therefore, certain ski areas are selected on the basis of previous experience at that area.

There is no doubt that this is important knowledge to consider in selecting training locations. At the same time, however, adaptability is an important aspect of technique. Consequently, coaches should look to vary training camp locations from year to year and should remain open to new possibilities.

Psycho - Social Variables: The Importance of Maximizing the Quality and Effectiveness of On Snow Training

Several psycho-social decision variables are considered by coaches in determining training camp locations. These are important in that they have a significant influence on the quality and effectiveness of training. In this

connection, the following four variables were identified on the basis of the interviews: (1) variety in the location, (2) compatibility of the location with the athletes, (3) creating a different environment in which to focus, and (4) proximity to other national teams.

Variety in the Location

In addition to varying the training location to gain access to variations in terrain and snow conditions, some of the coaches felt that it was also important to travel to different locations to maintain the athlete's motivation in training. One of the ski coaches expressed this sentiment in the following way:

> *"... To totally mix it up at a point in time I think would be a really healthy thing. And we tried to put something new and different into the program on occasion so that it would be completely fresh. So that it would not be, 'Well, if it is October, we are back in Sölden. If it is November, we are in Beaver Creek. If it is May, we are in Mammoth.'"*

Thus, coaches should beware of falling into the trap of training at the same areas from year to year. For athletes that have been training for many years, these sites will become less and less stimulating, both psychologically and technically.

Compatibility of the Location with the Athletes

Oftentimes in the preparation period, teams need to travel far from home to rather isolated locations in order to find quality training conditions. The more remote a location is, and the further away from home it is, the shorter is the amount of time before a drop in the productivity of training occurs. One coach explained that this is a result of simply too high of a "concentration"

of the training load, being in a remote location, and living with the same people. Eventually, problems not associated directly with the training begin to arise, such as personal conflicts within the group. When this happens, athletes lose the level of focus and concentration necessary for high quality training. It is thought that the more comfortable a group of athletes are at a training site, the longer a training period can be before this drop in productivity occurs. Therefore, one important decision variable coaches need to consider in selecting camp locations is how compatible a training site is with the athletes.

Creating a Different Environment in Which to Focus

Even though travelling far from home can lead to problems in training productivity as just discussed, at times it is worthwhile to specifically seek relatively isolated locations. As a case in point, many of the central European teams have Summer training sites which are very close to home. While this is often advantageous for training, as will be discussed later, some of the central European coaches who were interviewed felt that at times it was a good idea to select a location that required them to travel far from home for an extended time. In so doing, the athletes can get away from their everyday lives to focus more on training:

> *"... You get away. You know, you travel quite far to get there. So, you are a bit more quiet. You are sort of to yourself a lot more than what you are down [in Europe] where they have their family and friends and all that stuff not that far apart. So, I think that if you take them away, then they can really focus without any major interruptions."*

Proximity to Other National Teams

In alpine ski racing, performance is not measured in absolute terms but relative to the other competitors. This means that in the preparation period it can be difficult to determine how good a certain performance is if you do not have the best in the world on your team. As a result, athletes may have a hard time pushing their true, maximum intensity in training. As one coach expressed, this is of particular importance for American athletes who often have to train on their own due to geographical reasons:

> *"What we are missing in our training process in the preparation period is we don't see other skiers ski. Every race has to be approached with a maximum effort. And finding that maximum effort [in training] is a pretty difficult thing to do if you are always in the same group of people. You have to see how fast the others are going. And that is the gauge that we are missing a lot in the preparation period. We get too worked up inside the group and we lose that gauge where the best in the world are."*

Therefore, some coaches felt it very important to have training camps where you train beside, or even with another national team, referred to as "cross nation training" or "matching" by the coaches. In one instance, an interviewed coach felt that, for his athletes in particular, cross nation training was even more important than travelling to the Southern Hemisphere to train on winter snow conditions:

> *"The good thing about Europe I think is that you start feeling the environment. Other teams are there. It is a pretty rugged environment. Guys are skiing fast like shit. And you start feeling it there. You start feeling the intensity. It is the time for racing. And I think that is really, really important. That is what I really like about going to Norway instead of down to South*

America where we were there by ourselves a little bit, out in nowhere. Even if it is good training."

In addition to adding intensity to the training, by being close to other national teams, coaches can "keep tabs" on what the other nations are doing. For instance, one of the coaches indicated that this is especially important so that you become aware of equipment developments as soon as possible.

Altitude

Some of the coaches indicated that altitude is an important decision variable in considering training camp locations. Oftentimes however, there is no choice in this regard. In the late Summer and early Fall when snow conditions are at their worst in the Northern Hemisphere, a substantial amount of training must be completed at altitudes of over 3000 meters above sea level. Nevertheless, there are other times of the year when it is possible to choose between locations of different altitudes. In such cases, two aspects of altitude were important.

Altitude Affects the Quality and Effectiveness of Training

First, the interviewed coaches felt that altitude was an important variable to consider in selecting a camp location as it has a significant, negative impact on the productivity of training:

"What I have seen is that if you come with good technique to high altitude, then you can do well. But I have seen that people with problems still have the same problems afterwards."

A reduced performance upon acute exposure to altitude is well established in the literature, particularly for sports in which performance is a function of the aerobic capacity (McArdle, Katch, & Katch, 2000; Åstrand & Rodahl, 1986). Although the direct effects of altitude on technical and anaerobic events – such as alpine ski racing – are not as strong, performance may still be affected if the athlete suffers from acute mountain sickness (AMS) (Åstrand & Rodahl, 1986). Some of the common symptoms of AMS which may affect performance include headache, insomnia, poor concentration, gastrointestinal disturbances, and generalized weakness (Leach, 1994; McArdle et al., 2000). Moreover, acute exposure to altitude can affect performance due to moderate dehydration as a result of decreased thirst sensation and increased body water loss (Leach, 1994; McArdle et al., 2000). Although there is a large individual variability in the response to altitude, athletes who do not normally live at a high elevation and are not acclimatized to these altitudes are most susceptible to these problems.

In addition to affecting the actual performance of the athletes, the interviewed coaches felt that altitude can affect the total volume of training possible at a camp:

> *"It was different when we then went to Norway because you ski at lower altitudes. You can train more intense and you can handle more days on the trot than you can when you are at high altitude. Most of our training we do in Saas-Fee and Zermatt in Switzerland where you sort of are 3,500 meters up all the time."*

If it is necessary to train at high altitude, then it may be of benefit to select a location where the athletes can at least live at a low altitude. This might allow for a more complete recovery from each day of training than living at a high altitude.

Acclimatization to Altitude

Second, one of the interviewed coaches pointed out that in the early portion of the competition period, training camps and races are often completed at locations where the athletes must live, train and compete at over 2500 meters over sea level (Summit County, Colorado). In this regard, he felt that it was important to have training camps at locations where the athletes at least lived at moderately high altitudes throughout the late Summer and early Fall. In this way, they could acclimatize to these altitudes and thus be better prepared for the early competition period. McCardle et al. (2000) reported that acclimatizing gradually to moderate altitudes helps to prevent the occurrence of AMS. Again, this is probably more important for athletes who live at low altitudes than for athletes who live high most of the time already. This particular issue is discussed further in the section on the structure of the on snow training (p. 168).

To summarize, a number of variables that expert coaches consider when determining the location of training camps were identified on the basis of the interviews. One of the more important variables was how the possibilities for training at the ski area correspond to the technical goals for the camp in question. In addition, the coach's decision is limited by the constraints of travel and budget. Traditions within the ski federation and experience of the team's coaches at different ski areas were also an important factor to consider. A number of psychosocial variables that are directed at maximizing the quality and effectiveness of training were identified. These included variety in training locations from year to year, compatibility of the location with the athletes, creating a different environment in which to focus, and proximity to other national teams. Finally, some coaches indicated that they consider altitude when determining

training camp locations. On the one hand, they were concerned about the negative effects of altitude on the quality and volume of training. On the other hand, they were interested in acclimatization of the athletes in preparation for the early competition period.

7.4 Determining the Volume of On Snow Training

The third decision category under the planning of on snow training in the annual plan is how much total skiing to complete during the preparation period. In this connection, four main decision variables were identified on the basis of the interviews as being of importance (Table 7.2).

The Athlete's History

Understandably, one of the primary decision variables considered in determining the volume of on snow training is the athlete's history, i.e., how much skiing has the athlete done in previous years? This knowledge is then used to decide how much training to do in the current year, as demonstrated in the following quote:

> *"For a racer which I have now, which is like four to six years on the team, they have skied a lot. They have a pretty good base ... And my decision this year was to go a little down with ski days in this period ... because they have in many years now had a lot of training in this period. Ski days. And I thought it would be a variation to cut down and put more intensity into this training in this period."*

The Long-Term Plan

While some coaches described developing a year plan based primarily on the athlete's history, other coaches tried to systematize yearly variations in on snow training volume

into a long-term plan. Oftentimes, such a plan is timed for major championships such as the Olympics or World Championships. As a case in point, one such plan as

Table 7.2. Decision variables associated with the decision category of the volume of on snow training in the preparation period.

Decision Variables
• The Athlete’s History
• The Long-Term Plan
• The Importance of Maximizing the Quality and Effectiveness of On Snow Training
• Tradition and Experience

described by one of the coaches was built around preparing for the 2001/2002 Olympic season:

> *"... I think that we are going to ski a lot in 2000/2001. And then bring it down a little bit the next year going into the Olympics so that you have the freshness. They are really motivated. Because I think that the most important thing is the motivation in skiing. You have to be fresh and motivated. Hungry, hungry, hungry. So, I think that it [the skiing volume] would build up until 2000/2001. And then in 2001/2002, quality, racing-type skiing ... with a lot of motivation."*

The Importance of Maximizing the Quality and Effectiveness of On Snow Training

The interviewed coaches emphasized that while the total volume of on snow training is important to consider, it is the quality and effectiveness of the training which ultimately counts in the long run:

> *"I have seen more skiing in the summer time. I have seen less skiing. I have seen adding more skiing again. And to me, what I have learned from all that is that it is not the number of days that you have been on skis. It is what you have done, the types of training, that are important ... if you have, let's say, 60 days and another guy has 40, those 40 days might help more in preparing him to race because those days were more productive. You can go and spend a camp and if it is not productive, you are better off just focusing on conditioning then."*

In this connection, there is a limit to the total volume of on snow training an athlete can handle beyond which productivity falls below acceptable levels. Once this limit is reached, a person's time is better spent working on another aspect of preparation. This limit appears to be determined by a combination of both physical and psychological characteristics of the athlete. One coach

indicated that he felt that many athletes were skiing less than what they were physically capable of doing, but that psychologically they were not ready to train more.

Tradition and Experience

Coaches also consider tradition and experience in determining the total on snow training volume for a preparation period, as the following quote demonstrates:

> *"An athlete that can win a world cup slalom and is a specialist in slalom ... Normally, a female athlete trains between 6000 and 9000 gates in the prep period. And the guys go up to 11 to 12 thousand. So, there is a specific amount. It is the statistics that you write over the years where we find out that this is helping and this makes sense. It is a lot of trial and error."*

Although experience is irreplaceable in making such a training decision, there is a hidden danger. By considering only tradition or experience in determining the total on snow training volume, a coach may fail to adapt a training program to the individual needs of his or her athletes for the year in question.

In summary, the interviewed coaches identified a number of decision variables that they consider in determining the total on snow training volume during the preparation period. For one, the athlete's history, including how much training he has completed in past years, is an important consideration. In addition, some coaches consider a long-term plan that builds towards a certain point in the athlete's career, such as an Olympic year. The interviewed coaches also felt that the individual work capacity of the athlete was important to consider. Overextending the athletes, either physically or psychologically, leads to a decrease in the quality and effectiveness of the training. Finally, coaches refer to

their experience and tradition in determining the total on snow training volume.

7.5 Determining the Structure of On Snow Training

The fourth decision category under the planning of on snow training is the structure of training. This refers to how on snow training is organized as a part of the annual plan. For instance, coaches must decide when to have on snow training and how long on snow training periods should be. Based on the interviews, decisions regarding the structure of the on snow training were grouped into the following four sub decision categories: (1) the development of the on snow training over the course of the preparation period; (2) the distribution of on snow training periods; (3) the length of on snow training periods; and (4) the structure of training within the on snow training period.

A Description of the Development of the On Snow Training Over the Course of the Preparation Period

The development of the on snow training refers to how technique training progresses over time to build up towards the competition period. Of interest here is how training advances through the phases of technique drill, technique adaptation, and competition preparation training.

At the beginning of a preparation period, new goals for technical development are identified. Typically the first portion of the on snow training consists of technique drill training directed specifically at these goals. Even though the interviewed coaches considered this period very important to establish the foundation for further technical work, they felt that it is important to move relatively quickly into technique adaptation training –

for reasons described earlier (p. 124). The majority of a ski racer's technical training is then spent in this phase, learning to adapt to the essentially infinite number of possible variations of snow conditions, terrain, and course dimensions. Finally, in the early Fall, technical training is progressed to competition preparation training.

Interestingly, several of the ski coaches referred to having a double cycle of this progression over the course of the preparation period (Figure 7.1). In this case, training begins with technique drill followed by technique adaptation training in the Spring. Towards the middle of the Summer, some competition-like training is completed to "test" the skills under competition conditions. If training in the Southern Hemisphere, athletes may even participate in races for training. Then, a step back is taken, and any refinements to the new skills are initiated over the course of a short period of technique drill training. Training is then progressed once again to adaptation and then competition preparation training prior to the start of the competition period. One of the interviewed coaches described this in the following manner:

> *"I think that you almost need one cycle before the season comes so you already have skied out. You already have been on the top during the preparation period sometime. Have some timing. Timing a lot. You get better. And then you go down again and work on technique, feeling, tactics, whatever you want. And then you build up again and on the second wave you hit the season. That would not require a lot more skiing. But it would require those camps with high intensity during the summer."*

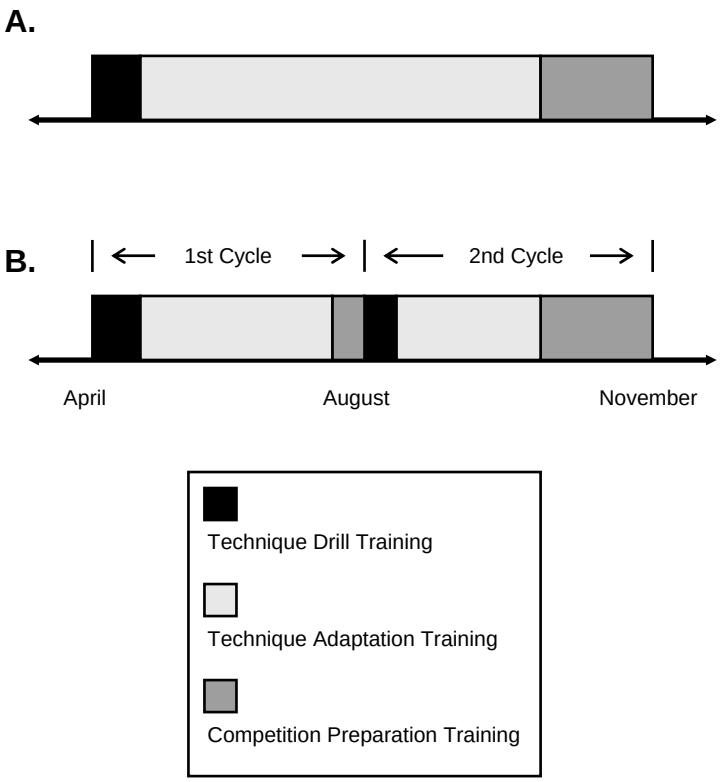

Figure 7.1 A graphic representation of the development of the on snow training over the course of the preparation period. Figures A and B demonstrate a single cycle and double cycle, respectively. See text for explanation.

From a theoretical perspective, this might be considered a double periodization of the on snow training. Potential benefits of such a strategy include the possibility to test technique in competition conditions relatively early in the preparation period (McInnis, 1981). This would then provide important feedback regarding what to prioritize in technical training during the last half of the preparation period. Another benefit is an increased proportion of competition preparation training for the year (Balyi & Hamilton, 1995; Matveyev, 1977/1981; McInnis, 1981; Stein, 1998; Suslov, 1974). This could, for instance, assist with the goal of developing psychological skills for coping with the pressures of competition (Bourne, 1993; McInnis, 1981; Suslov, 1974) as well as ensure the development of a high intensity technique.

One of the difficulties encountered in planning the development of technical training is related to the instability of the environment in which alpine ski racing is performed. On the one hand, if a coach strictly follows an “ideal” development from the theoretical perspective, the athletes may lose some opportunity to improve because the theoretical progression did not correspond to the actual circumstances. On the other hand, if a coach plans training from day-to-day simply based on the changes in training opportunity, there will be a lack of systematic progression in the training. The challenge that a coach is faced with is maintaining a balance that emphasizes a systematic development in the technical training while trying to maximize the use of opportunity.

An example of this problem in the context of creating the year plan will serve to illustrate this point. Due to seasonal changes in the environment, the level of training

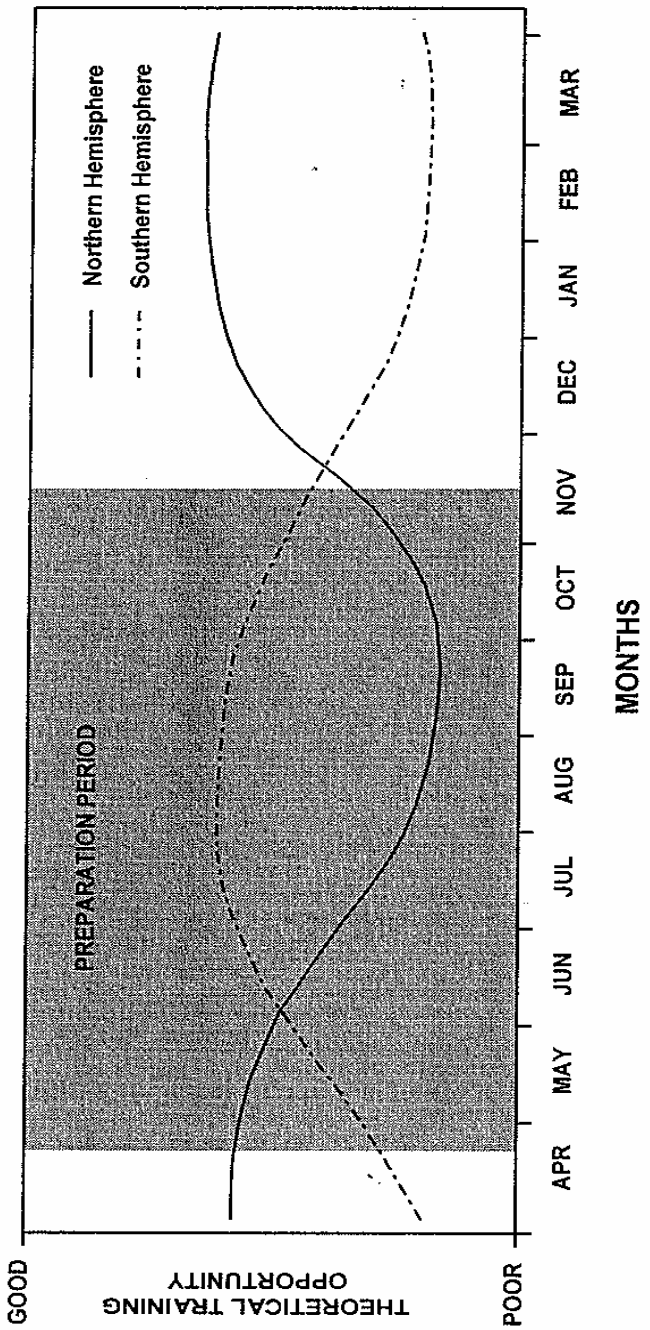

Figure 7.2. A graphic representation of changes in the average level of theoretical training opportunity over the course of the year in the Northern and Southern Hemispheres.

opportunity varies over the course of the year (Figure 7.2). In the Northern Hemisphere, training opportunity is relatively good right after the competition period. At this time there are long runs available, plenty of snow with which to build extra terrain, and possibly winter-like snow conditions. Unless one travels to the Southern Hemisphere, this quality of training opportunity is not available again until early November. As these good snow conditions are especially conducive to technique adaptation and competition preparation training, there is a temptation to take advantage of them by training long, challenging courses in the Spring. At this time of the preparation period, however, technique drill training should - theoretically speaking - be the priority, depending on the goals of the athletes. One ski coach expressed this problem in the following two quotes:

> *"The training that I always feel like I end up planning out in this country is really affected a tremendous amount by the facilities that are available to us. So, we end up doing things that we don't necessarily prefer to do first. We end up doing those first to take advantage of the facilities that we have available to us. It is almost like doing your power training before you do your strength training. So, then we always have to find a time to come back and do our basic technical skills training."*

> *"... we end up doing, in Mt. Batchelor or Mammoth during that period of time [May], more race-type of training because we are already on terrain. And at that time of year, we want to try to identify those things technically that may be the major weaknesses that an athlete may have and begin that correction process."*

The interviewed ski coaches emphasized that in such cases, it is best to prioritize the long-term technical

development of the athlete rather than “running around in the short-term screwing that up.” In this particular example, rather than completing competition preparation training merely to take advantage of the opportunity in the early preparation period, the focus should be on maximizing the use of the available opportunity towards technique drill training:

> Sub: *“A lot of coaches want to go in May or June and we have to have full-length courses because there is great snow. You go to Mammoth and you can ski top to bottom. And I think that you don’t need to have full-length courses. Your training then is to change or improve something that is technical. It is no use to ski long courses to get anaerobic, to get lactic acid in the legs.”*
>
> Int: *“Because the season is so far away?”*
>
> Sub: *“Yes. It is better then that you are able to improve something in their way of doing the turn, technically, and that they can focus on that.”*

By having a clear, long-term picture of the athlete’s technical development over the course of the preparation period, a coach can maximize the use of training opportunity in the direction of achieving these goals. As Müller (1984) states, “... if we as instructors first know **what** we want, and **why** [emphasis added] we want it, then we can consciously make use of every possible opportunity around us and perhaps, through better organization, create many more” (p. 11).

Determining the Distribution of On Snow Training Periods Over the Course of the Preparation Period

The second sub decision category under the structure of the on snow training is the distribution of on snow training periods. This refers specifically to how on snow

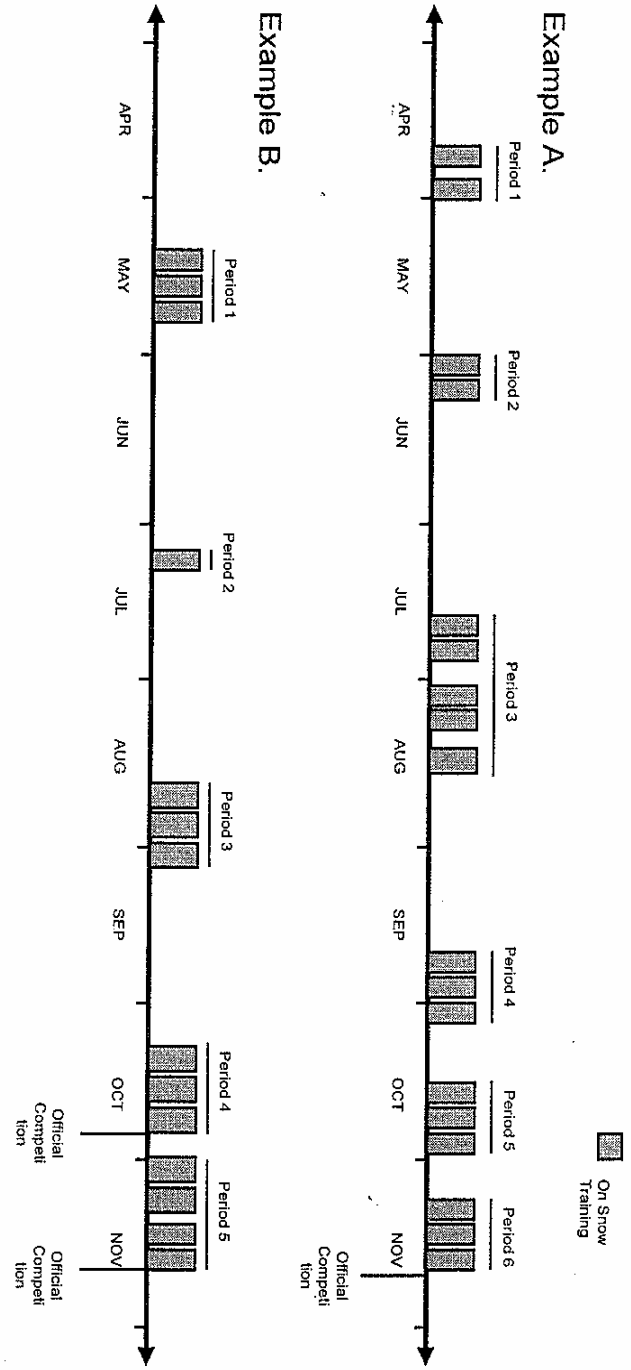

Figure 7.3. Two examples of the distribution of on snow training periods as described by two of the interviewed ski coaches. Examples A and B were taken from a Norwegian Europa Cup / FIS team and an American World Cup team, respectively.

training periods are spread throughout the preparation period, i.e., when technical training is planned. Two examples of this distribution from different countries are presented in Figure 7.3.

Before continuing with a discussion of what the interviewed coaches had to say about the distribution of on snow training, it is necessary to define a couple of terms (Figure 7.4). The first term, an **on snow training camp**, is for this thesis defined as a concentrated block of on snow training in which there are no more than two consecutive rest days. If there is a rest period of three or more days, then this is considered to be two separate camps. I am considering an **on snow training period**, the second term, to be a block of time consisting of one or more training camps and the rest periods in between. Rest periods in an on snow training period are not longer than one week. Otherwise I am considering it as two distinct on snow training periods. Although these definitions are somewhat arbitrary, it is important to systematize them for the purposes of further discussion of the structure of on snow training.

A variety of decision variables were identified in the interviews as being considered by coaches when making the determination of when to have on snow training periods (Table 7.3). Some of the more important variables are described in this section.

Considerable Resources are Necessary to Create a Quality On Snow Training Environment

The sport of alpine ski racing is unique from other technical sports because considerable resources in terms of time, money, and staff are necessary to achieve high quality conditions for technique training. For instance, it is not uncommon for coaches to travel to a training

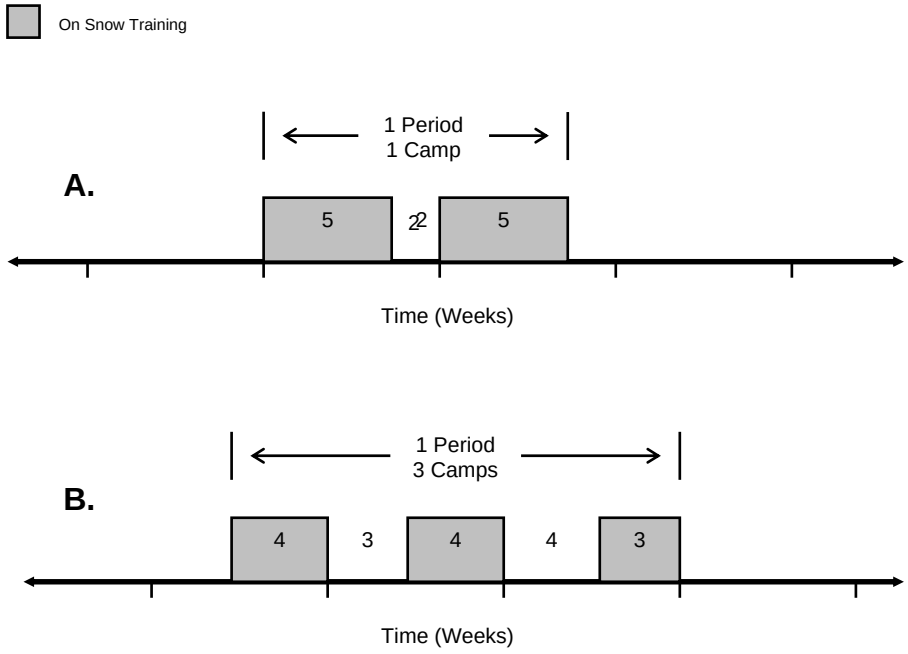

Figure 7.4. A graphic representation of the definitions for an on snow training camp and an on snow training period as used in this thesis. Graphic A and Graphic B are characteristic of the concentrated-camp distribution and the micro-camp distribution, respectively. The numbers represent total days of skiing and rest in gray and white, respectively.

Table 7.3. Decision variables associated with the sub decision category of the distribution of on snow training periods in the preparation period.

Decision Variables
• Considerable Resources Are Necessary to Create a Quality On Snow Training Environment
• Carry-Over ⇨ Carry-Over From the Previous Competition Period ⇨ Carry-Over From One On Snow Training Period to the Next ⇨ Carry-Over From Preparation to the First Competitions
• The Time of Year and the Quality of Training Opportunity ⇨ The Spring: Taking Advantage of the Good Training Opportunity ⇨ The Summer: Pursuing Winter Snow Conditions in the Southern Hemisphere ⇨ The Fall: Timing On Snow Training Periods to Maximize Both Training Opportunity and Carry-Over
• The Structure of Dryland Training and Recovery
• Tradition and Experience
• Psycho-Social Variables: The Importance of Maximizing the Quality and Effectiveness of On Snow Training ⇨ Variety from Year-to-Year ⇨ The Time of Year and the Level of Motivation
• Acclimatization to Altitude
• Constraints

camp location a few days prior to the start of the camp to prepare the hill and ensure that adequate safety measures are in place. Considerable manpower is also required each day during the camp to maintain quality in training.

Due to this high demand on the team's resources, athletes are dependent on a support system of coaches to help in establishing a productive training environment. This means that technique training cannot simply be completed at any time; Rather, it must be concentrated into periods of time when the coaching staff and athletes can come together to train.

Carry-Over

"Carry-over", a term used by some of the interviewed coaches, refers to the transfer of previously learned skills over time to new periods of training. There are three contexts during the preparation period in which carry-over is considered: carry-over from the previous competition period; carry-over from one on snow training period to the next; and carry-over from training to competition.

Carry-Over from the Previous Competition Period

Some of the interviewed coaches felt that athletes typically ski at a relatively high technical level at the end of the competition period. Additionally, it is thought that the athletes have a strong picture of what good skiing looks like having just competed with other high-caliber racers. Hence, coaches described the early Spring (i.e., April and May) as a good time to organize technical training:

> *"What I found was most efficient was to get some skiing in right away, pretty early. What I learned is that you are very quick if you are*

> *skiing at a high level. So, there wasn't a lot of time lost getting back on to it. So, it was a good time to really try to change the way of skiing or learn a new thing. Or adapt to new equipment. Because they were skiing at a very high level."*

Interestingly, this contrasts with Matveyev's (1977/1981) view that technique training should be proceeded by a prolonged period of time during which the skills to be modified are not used in action. Matveyev felt that this period of readaptation facilitated the "extinction" (Matveyev, 1997/1981, p. 118) of previously automated skills.

Carry-Over from One On Snow Training Period to the Next

As discussed previously, it is necessary to concentrate technique training into blocks of time due to the travel required to get to on snow training and the logistics of developing a quality training environment. In between these blocks, little on snow training takes place, if any at all. The concern of the interviewed coaches is when the amount of time between two periods of skiing is too great. In such cases, a considerable amount of time must be spent at the beginning of the following period to review previous training instead of further developing skills. One of the coaches explained this in the following manner when asked about the spacing between two ski training periods:

> *"... just so there is less time between camps to lose any ground. It is giving them an appropriate time for some recovery to get away from it, but come back still with the muscle memory fresh and able to pick up where they left off. If that time is short, then the learning curve starts to move up again a little bit quicker. That is my practical experience. If the time is long, then it will drop down further and it will take more*

time just to get back to where they were when they left the last project."

The interviewed coaches felt it particularly important from August to November to have a progression in training which carries-over from one period to the next in building towards the competition period. Therefore, it is particularly important to minimize time between on snow training periods in the Fall.

Carry-Over from Preparation to the First Competitions

Carry-over from training to the first competitions is also considered important in planning the distribution of on snow training. Consequently, the last on snow periods are usually timed to lead right into the first competitions. For athletes that compete in the October World Cup, this means that there is usually a training period immediately prior to the race.

The Time of Year and the Quality of Training Opportunity

As described previously, the level of training opportunity varies over the course of the year due to seasonal changes in weather and snow conditions (Figure 7.2). The interviewed coaches indicated that it is important to consider these changes in training opportunity when planning the distribution of on snow training in the preparation period - the goal being to distribute on snow training to maximize the use of good training opportunity.

The Spring: Taking Advantage of the Good Training Opportunity

Early in the preparation period, there are typically very good conditions in the Northern Hemisphere. At this time, there is plenty of snow and very few groups are training. Considering this, as well as the desire to maximize the carry-over from the competition period, more and more on

snow training is being planned for the period of time immediately following the race season:

> *"In April we used to have a camp each year because we can have really good winter conditions then. That is the last month with winter conditions so we use this one."*

The Summer: Pursuing Winter Snow Conditions in the Southern Hemisphere

Over the course of the Summer, training opportunity in the Northern Hemisphere steadily diminishes as the snow pack melts. By July, the training opportunity is usually relatively low. Therefore, on snow training is minimized and dryland training becomes the focus.

Perhaps the most critical time of the year for training opportunity is late August and early September. The winter snow has not yet begun to accumulate to any great degree in the high mountains of the Northern Hemisphere. Many clubs and development teams begin training at this point and are competing for the already severely limited training space. On the other hand, snow conditions are often very good in the Southern Hemisphere at this time and many teams elect to travel there to take advantage of the good training opportunity.

The Fall: Timing On Snow Training Periods to Maximize Both Training Opportunity and Carry-Over

In the Fall, on snow training is distributed to maximize both carry-over and training opportunity. An example from one of the American ski coach's description of his training plans for the 1998/1999 season illustrates this point. This coach's approach to setting up the Fall is presented in Figure 7.5.

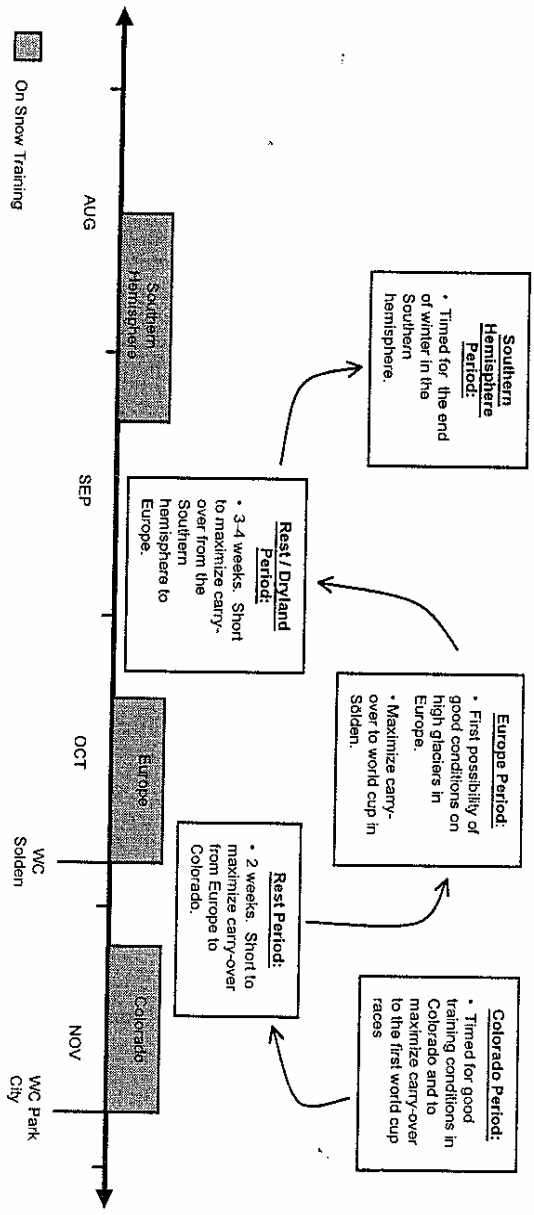

Figure 7.5. A graphic representation of the distribution of on snow training periods in the Fall for an American world cup team. On snow training periods are timed to maximize both carry-over and training opportunity while at the same time allowing for adequate rest periods.

Working backwards from the end of the preparation period: the final ski period of the preparation period was timed both to capitalize on good snow conditions in Colorado in early November and to maximize carry-over into the first races of the season.

In between the Colorado and Europe ski periods, a two week recovery period was planned. This rest period was to be long enough to give the athletes time to recover but short enough to minimize any loss in the carry-over of training from Europe to Colorado. This also placed the Europe training period when good conditions were possible on some of the high glaciers.

Prior to the Europe period, there was a three to four week recovery / dryland period. Again, the amount of time here was reduced to maximize the carry-over in training from the August period - which was planned for the Southern Hemisphere - to the training in Europe. To move the August period any later to cut down on the time between these two ski periods would have meant risking running into warm, spring temperatures in the Southern Hemisphere and having to train on salted snow instead of winter snow.

Some of the coaches warned against trying to do too much training in the Fall. With the snow conditions improving, the pressure of the approaching competition period, and the fact that much of the training in the Fall is at high altitude, it is very easy to do too much and burn an athlete out:

> *"It is so easy in this period to do a lot of training and then when you come to a race, you are totally flat. This is a big problem for U.S. racers I know. They get the snow here, and they have the advantage over all the other teams that they can train good and stuff. So, then they train like hell. And at altitude. And then they are dead when they are starting. So, I have*

talked to some people and we discussed this. And they said that I have to try it. And do not much, but a lot of quality. And competition every day."

As will be discussed later, one of the important times in the year to perform well is the start of the competition period (See The Importance of a Good Early Season Start, p. 284). But if the athlete is burnt out, he will need to rest while everybody else is building up to the season.

The Structure of Dryland Training and Recovery

According to the interviewed coaches, it is important to maintain a balanced plan which takes into account not only the needs of on snow training, but also those of dryland training and recovery. Dryland is usually the priority during the first half of the preparation period. Thus, relatively long periods of time are left between on snow periods to allow time for conditioning as well as time away from skiing and the team environment. The priority shifts to on snow training during the second half of the preparation period. Accordingly, less time is allocated to conditioning. On snow training periods are planned closer together to maximize carry-over.

Both the structure of dryland training and the structure of recovery are discussed further in subsequent chapters (chapters 8 and 9, respectively).

Tradition and Experience

As discussed earlier in regards to determining training camp locations, coaches and ski federations gain considerable experiential knowledge in terms of where and when quality conditions can be obtained. The importance that this experience plays in planning is clear. However, some of the coaches hinted to a hidden danger when experience evolves into tradition. For instance, when

asked about why the distribution of on snow training was planned in a certain way, one of the coaches replied:

> *"This is the way things have been done for years and this is the way that they are continued to be done. I don't have a lot of say in it like I said. I am not consulted."*

Thus, some of the interviewed coaches felt as if tradition from within the federation acted as a constraint and limited their options. A good example from the interviews can serve to illustrate this point. In recent years, there appears to have been a tendency to separate on snow training and dryland training into more distinct periods, with the on snow training being primarily concentrated around times with good training opportunity. However, both Example A and Example B in Figure 7.3 still have a relatively short period of on snow training that is both isolated from the other on snow training periods and takes place during a time with relatively poor training opportunity (Period 2 in both examples). In Example B, this period was only four to six skiing days long.

A couple of the coaches began to question the value of such a short period and wondered if it might not be more effective to drop that period and include those few days with one of the longer periods. This would benefit in both a longer progression in on snow training and a longer, uninterrupted block of dryland training. The thing that is scary though is to have such a long block away from skiing.

Part of the problem when tradition acts as a constraint is that we just do not know if one way is better than the other. When one considers that an athlete's livelihood and career are at stake, it is easy to see that there is a great deal of risk in breaking from tradition. But as

Aamodt (2000) pointed out, elite sport is in constant development. He feels that it is often the young athletes who have nothing to lose by risking changes to potentially better training methods who drive the development of sport further. Similarly, the interviewed coaches emphasized that you can not be afraid to change - that you need to be constantly looking towards the future.

Psycho-Social Variables: The Importance of Maximizing the Quality and Effectiveness of On Snow Training

The interviewed coaches identified two psycho-social variables as important in determining the distribution of on snow training – variety from year-to-year and fluctuation in the athlete's motivation over the course of the year. These have great influence on the quality and effectiveness of on snow training.

Variety from Year-to-Year

By varying the distribution of on snow training periods from year to year, coaches can help maintain motivation of athletes. As one coach expressed, this becomes particularly important for racers who have been on the team for many years:

> *"I think that when you have racers that have been on the team for ten years that it is not good when it is the same thing, the same rhythm, each year. I think if you want to bring something new into the team, a new spirit or something, that you have to change the program a little bit. Like maybe the guys need a longer break after one season to get hungry again. To get motivated. Maybe we give them April free from all training. And then we would start up slower in May. We would try to come up with something new ... And then they feel that it is something new and that this year we really have a goal for something. It is not the same as we did the last five years."*

This motivation is important because, as discussed previously, a high level of motivation and focus is essential for quality technical training (Christina, 1988; Major & Svendsen, 1995; Schmidt, 1999; Schröder et al., 1982; Stein, 1998; Aamodt, 1999).

The Time of Year and the Level of Motivation

The interviewed coaches also felt an athlete's motivation level changes depending on the time of year and that this should be considered when determining the distribution of on snow training. In particular, while the training opportunity is high in the Spring, motivation for skiing is often relatively low. Therefore, it may not be productive to train as much in the Spring as one would like considering training opportunity and carry-over alone (See Carry-Over from the Previous Competition Period, p. 159 and The Spring: Taking Advantage of the Good Training Opportunity, p. 161).

Acclimatization to Altitude

According to one of the interviewed coaches acclimatization to altitude is a consideration for the distribution of on snow periods through the Fall:

> *"... all of these races in the beginning [of the competition period] are made at high altitude. They are races above 2500 meters. And, usually what you have to think about a little bit is that you have to prepare them for that with the planning of the July, August, September, October, and November camps. The space between these camps and the lengths of these camps should be, within practical reason, planned so that you can have a little bit of a lead from one camp to another camp as far as acclimatization to altitude."*

There is some evidence to support such a strategy, particularly for athletes who live at low altitudes. For

example, experience with the use of altitude training in the preparation of elite cross country skiers has been reported by Strømme and Ingjer (1994). They found the effects of acclimatization to altitude accumulated over the course of three separate, moderate altitude camps, interspersed with periods of time at low altitude. Among their recommendations were that the first of the three camps should be long – at least 18 days in length – and that the interim periods at low altitude between camps should not be longer than three to five weeks.

Constraints

Depending on the specifics of the situation in which a coach finds himself planning, a variety of logistical constraints may need to be considered in planning the distribution of on snow training. For instance, one ski coach indicated that one should keep special holidays in mind and try to plan so that athletes and staff can be home with their families on those days.

It is also important for the coach to balance media and sponsor responsibilities with the training plan. When possible, sponsor photo shoots and the like are timed to correspond with training camps so as to save athletes the extra travel and time away from home.

Determining the Length of On Snow Training Periods

The third sub decision category for the structure of the on snow training is the length of on snow training periods. Here, coaches must decide how long technical training periods should be. Three variables were identified in the interviews as being important in making this determination (Table 7.4). Each of these is described here.

Table 7.4. Decision variables associated with the sub decision category of the length of on snow training periods in the preparation period.

Decision Variables
• The Time of Year and the Quality of Training Opportunity
• The Importance of Maximizing the Quality and Effectiveness of On Snow Training: The “Pace-Yourself Syndrome”
• The Form of the Structure of Training Within the On Snow Training Period

The Time of Year and the Quality of Training Opportunity

One variable considered by coaches in determining the length of on snow periods is the quality of the training opportunity at the particular time of year and location in question (See Figure 7.2). As a general rule, longer periods are planned for times with high training opportunity while relatively short periods are planned for when the training opportunity is poor.

A good example of this is the short period of on snow training in July described by the American coaches (See Figure 7.3B, Period 2). One goal behind this ski period was to bridge the carry-over in training from the Spring camps to the late August training period. But due to the relatively poor training opportunity at this time, this period is kept to only a few days in length. One coach explained:

> *"The July camp is a relatively short time on snow. We don't ski more than five or six days. Most of the athletes ski between four and six. And that is enough. The snow is not that great there. It is not worth, in my opinion, to ski a lot more at that time of year, depending on the individual of course."*

The Importance of Maximizing the Quality and Effectiveness of On Snow Training: The "Pace-Yourself Syndrome"

The importance of maximizing the quality and effectiveness of on snow training is also a factor considered by coaches in determining the length of technical training periods. To have a high quality in training means that there must be a correspondingly high level of motivation, focus, and intensity on the part of the racer. If on snow training periods are too long, an athlete may sub-consciously lower his level of intensity to endure the training period. One

of the ski coaches referred to this as the “pace-yourself syndrome,” which he described in the following manner:

> *“If we make a marathon out of a training camp, that it lasts three to four weeks long, people will pace themselves naturally. They know how much time we are supposed to be there and they will go, ‘Whew! Man, we still have four more days on snow and I am already tired.’ And they will back off on the amount of runs or how much effort they put into each run ... And I think that if you keep it to ten days on snow and stuff and you have these blocks, people can always see the light at the end of the tunnel. So, when they are there, they are willing to give 100% during that time.”*

This confirms Bourne’s (1993) observation that breaking up training into shorter blocks can aid the athlete in psychologically coping with the demands of a long, hard period of training. It is therefore important that a certain balance is maintained. Training periods should be long enough to allow a significant volume of training but short enough to accommodate high levels of intensity and focus in the training.

The Form of the Structure of Training Within the On Snow Training Period

The interviewed coaches also identified the structure of training within the ski period as an important variable in determining its length. Based on the interviews, two forms for the structure of the on snow training within a ski period were identified: the micro-camp structure and the concentrated-camp structure (Figure 7.4).

An on snow period based on the micro-camp structure often consists of three to four relatively short camps. These camps are typically separated by small, three to five day breaks for recovery where the athletes have the opportunity to get away from the camp situation and, in some cases, even go home.

The concentrated-camp structure, on the other hand, usually consists of one long camp where all of the training is concentrated together in time with only one or two days for rest. A number of factors play a role in determining which structure coaches choose for a certain on snow period. These are discussed in the following section, entitled Determining the Structure of Training Within the On Snow Training Period (p. 174).

In regard to the length of a training period, the concentrated-camp structure is usually associated with a shorter period of training and less total on snow training volume than the micro-camp structure. The reason for this is that the length of time athletes are able to tolerate the high density of training and time away from home has a limit which, once passed, affects the productivity of training significantly:

> *"When you do things that are too long, a few things happen. The productivity of the camp goes downhill. And you also see more tension amongst the athletes. Personal conflicts start to come into play more when you start spending over two weeks together when you are rooming together, sleeping together, everything. People start to grate on each other and they get snappy and cranky."*

Furthermore, much of the preparation period's training facilities are in rather remote locations with very limited social activities. With today's needs of a modern, young adult this can be quite demanding and may affect the length of time that the athletes are productive in training.

In contrast to the concentrated-camp structure, the quality of rest afforded by the micro-camp structure allows athletes to train productively for a longer period of time. The interviewed coaches felt that ultimately the

micro-camp structure allows for a higher volume of better quality training to be completed because of this better rest.

> *“These micro camps are really nice because the rest is better. They train four days and then drive home. Sleep at home. Meet their friends. Have a normal life. And then go back into training.”*

In summary, three decision variables for determining the length of on snow training periods were identified on the basis of the interviews. First, the quality of training opportunity at different times of the year plays an important role. Typically, longer on snow periods are planned for times when the training opportunity is good and shorter periods for when the opportunity is poor.

The importance of maximizing the quality and effectiveness of training is also a consideration. On snow periods that significantly exceed the capacity of the athletes are thought to have a negative effect on the quality of training. One coach referred to this as the “pace-yourself syndrome.”

Finally, the structure of on snow training within the period should be considered when determining the overall length of the training period. It is thought that the micro-camp structure allows for longer training periods and, ultimately, a higher volume of greater quality training than the concentrated-camp structure.

Determining the Structure of Training Within the On Snow Training Period

The last sub decision category identified for the planning of technical training consists of decisions regarding the structure of training within the on snow period. Two general forms for the structure of on snow training within

a ski period, the concentrated-camp and micro-camp structures, were identified on the basis of the interviews (Figure 7.4). Although it is generally agreed that a larger volume of higher quality training can be achieved with the micro-camp structure, both forms have advantages and disadvantages. The decision variables which coaches use to determine which structure is more appropriate to a certain situation are listed in Table 7.5 and discussed in the following sections.

Constraints: Travel and Budget

One of the primary variables determining which structure is selected are the constraints of travel and budget. For on snow periods where the athletes and staff must travel a great distance to train, use of the micro-camp structure would result in too much travel and expense. In such cases, there is no choice and the concentrated-camp form must be used. Seen from this perspective, this is an advantage for the central European teams who often have only short distances to travel during the preparation period to training camps. This allows them to use the micro-camp structure of training for much of the preparation period.

The Time of Year

All other factors remaining equal, the concentrated-camp structure demands more of the athletes, both physically and psychologically, than the micro-camp structure in order to have productive training. In periods where either the athlete’s motivation or physical capacity is relatively low - such as in the early preparation period - the micro-camp structure is preferred because it is more conducive to quality training.

As a case in point, one of the ski coaches described how he planned on using the micro-camp structure for the first

Table 7.5. Decision variables associated with the sub decision category of the structure of training within on snow training periods in the preparation period.

Decision Variables
• Constraints ⇨ Travel ⇨ Budget
• The Time of Year
• Psycho-Social Variables ⇨ Get Used to Being Away ⇨ Team Building
• The Contents of the On Snow Training
• Tradition
• Flexibility with the Weather and Snow Conditions

period of on snow training in April. Specifically, he planned four days of skiing followed by three days of rest and then another four days on snow. He felt the first days skiing after a prolonged break were particularly hard on the body. By giving the athletes some extra rest he hoped to improve the quality in training the last four days.

Psycho-Social Variables

Two psycho-social decision variables in determining the on snow training period structure were described by the interviewed coaches. In this connection, the coaches considered (1) the need for the athletes to get used to travelling and being away from home for extended periods of time and (2) team building.

Get Used to Being Away

During the competition period, the athletes must spend a great deal of time away from home, regardless of their nationality. To prepare for this, some of the interviewed coaches indicated that it was necessary to have some on snow periods where they traveled far away from home and used the concentrated-camp form for training structure. In this way, the athletes get used to being on the road, as one of the European coaches pointed out:

> *“I don’t think that it is a good thing if you stay away for too long with the group. I don’t think that it fits in very easily with achieving very good results or doing very well. But I think that at some stage you have to do it as well in order to get used to it.”*

Team Building

In addition to helping athletes deal with the stresses of travel and being away from home, the concentrated-camp structure may be more conducive to team building. Some of the coaches explained that with the micro-camp structure the athletes never bring their personal lives to camps which can make team building more difficult. In the concentrated camp structure, on the other hand, the athletes are forced to live and work together. There is also time to do social activities as a group, as one coach suggested:

> *"The social side of it, too, I think works quite well [with the concentrated-camp structure]. Because you are together over the whole period. Perhaps you go and visit some place or something like that. You get a little different sight of things than just on the camps where you are there four days and that is it and everything is very much just on skiing. You know, you can work 100% on skis but you also get that bit of a difference on the social side which I think is good."*

The Contents of the On Snow Training

Depending on the phase of technical training, different forms for the structure of training within the on snow period may be more ideally suited. For instance, one of the characteristics of technique drill training described earlier is the importance of success. In this connection, the micro-camp structure of training may be more conducive to training due to the better rest.

Conversely, during technique adaptation training, it is important for coaches to begin taking away factors that facilitate a successful performance and to begin exposing the athletes to the challenges that they will encounter in the competition period. For instance, the interviewed coaches felt it important that the athletes are prepared

to perform over an extended period of time, a situation that often arises in the competition period. One of the head coaches expressed this in the following way:

> *"One of the things that we have to do is we have to get used to physically and psychologically having demands of being able to ski more than three days in a row. And, often times when we are at race locations we have bad weather or circumstances that make you prepare every day for a number of days. And it is not just three or four. Sometimes it can be eight and sometimes it can be ten. And sometimes it can be twelve in a row. And you have to be ready for that type of thing. You can't be shocked if it happens."*

To achieve this goal, the concentrated-camp structure may be more appropriate. At the same time, however, the coaches stressed the importance of not allowing the athletes to ski sloppy for too long before taking a break.

In competition preparation training, the psychological stress is very high. It is important the athletes have a high level of motivation and intensity in their skiing. They must be well-rested and "hungry" to ski fast. As one of the head coaches pointed out, the micro-camp structure may again be more favorable under these circumstances:

> *"... If you can pace the November camp into smaller camps, then you are better off. Let's say, have three camps that are going with a long camp. The thing that is going on is that there is a lot of mental pressure building up before the races start. There are a lot of expectations which takes a lot of energy. So, that is why I like breaking up the camps and you get some time off."*

From a motivation perspective, it is probably ideal to vary between both structural forms over the course of the preparation period and from year to year. For instance, it may be beneficial to begin the preparation period using

the micro-camp structure to facilitate successful technique drill training. During the middle of the Summer, when there are typically periods of technique adaptation training, the concentrated-camp structure can be used to challenge the athletes to train in fatigued conditions. In the Fall, it is conducive to use the micro-camp structure again so that the athletes are fresh, motivated, and hungry to ski.

Tradition

Tradition also plays an important role in the determination of the structure of on snow training within a training period. For example, the ski federation may mandate that certain practices are followed:

> *"When I started with the Swiss last year, that is how it was. And I think that it is fairly traditional. I think there is from the federation side ... they feel that four days is sort of around the ideal range for a training camp."*

Flexibility with the Weather and Snow Conditions

Regardless of which training structure is selected, once the camp has begun it is necessary that the structure of training is flexible with changes in weather and snow conditions. The following quote by a ski coach serves as an example to illustrate this point:

> *"This camp we planned three days of training, one day off, and then three days training. But it can change. Like, I think that when we were at this camp we had weather problems and then we go maybe four days and then we make the break. We work in this direction. We work with the weather. But then we for sure have to take the consequences ... that this fourth day we maybe don't make so many runs."*

In this connection, the micro-camp structure may allow for greater flexibility and productivity. For instance, if poor weather is a factor, it may be possible to shift the blocks of training and recovery within the on snow training period without upsetting the entire annual plan. With the concentrated-camp structure, such adjustments would be more difficult.

In summary, the interviewed coaches discussed a number of factors considered in determining the structure of training within the on snow training period. Perhaps the primary decision variable is the combination of travel and budget. For teams that have to travel large distances to training camps, the micro-camp structure is not an option.

The coaches also explained that the time of year and the level of motivation should be considered in determining the structure of on snow training. During times where the athlete’s motivation is low, the micro-camp structure may be more conducive to effective training.

Some psycho-social variables were also identified. The concentrated-camp structure can help athletes get used to being away from home for extended periods of time as well as give the opportunity for team building.

In addition, depending on the phase of technical training certain training structures may be more appropriate. For instance, the micro-camp structure may be more appropriate for technique drill training while the concentrated camp structure may work better with technique adaptation training.

Finally, tradition and flexibility with the weather were also important considerations that the coaches identified in determining the structure of on snow training.

7.6 Summary

In summary, the planning of on snow training in the preparation period is an important aspect of the annual plan to consider. Four decision categories for this class were identified on the basis of the interviews.

The contents of on snow training refers to the various means and methods which are used in technique training. Similar to the literature, three phases of training – technique drill training, technique adaptation training, and competition preparation training - were described by the coaches. The coaches also emphasized the importance of a high quality and effectiveness of training.

The second decision category refers to determining the location of training. A number of variables were identified as being important in this regard. In particular, the goals of the training and how well these correspond to the training possibilities at the different areas, is an important factor. Additionally, the coaches spoke of several psycho-social variables geared at maximizing the quality and effectiveness of training. This includes variety in the location, compatability of the location with the athletes, creating a different environment in which to focus, and proximity to other teams. Altitude was an important factor to consider as it can affect the quality of training and is important in acclimatization.

The third decision category refers to determining the total volume of on snow training in the preparation period. The primary variables considered in this decision are the athlete’s history, the long-term plan, the importance of maximizing the quality and effectiveness of on snow training, and tradition and experience.

The fourth decision category is the structure of on snow training. This is divided into four sub decision categories. The first sub decision category represents the development of on snow training over the course of the preparation period. The interviewed coaches described a model where training is progressed from technique drill to technique adaptation and finally competition preparation training. Interestingly, some coaches described a double cycle of this progression in the preparation period.

The second sub decision category refers to the decision of how to distribute on snow training throughout the preparation period. Some of the more important variables discussed in this connection include carry-over, the time of year and the quality of training opportunity, and the structure of dryland training and recovery.

In regard to determining the length of on snow training periods, the third sub decision category, it was discussed that while a training period needs to be long enough to get some training done, it should not be so long that a drop in the quality of training occurs. This is related to the structure of training within the on snow training period. It is thought that the micro camp structure allows for a longer training period than the concentrated structure due to the better rest.

The final sub decision category refers to the choice between the micro-camp structure and the concentrated camp structure. Important variables to consider here include the constraints of budget and travel, the time of year, and the contents of the on snow training.

CHAPTER 8. THE PLANNING OF DRYLAND TRAINING IN THE PREPARATION PERIOD

8.1 Introduction

A second class of decision categories in the preparation period was defined to represent the planning of dryland training. Similar to on snow training, decision categories for the contents, volume and structure of dryland training could have been defined on the basis of the interviews. However, issues regarding the contents and volume of dryland training were not discussed in enough detail that I am comfortable drawing any conclusions from the data. Instead, the interviews focused on how dryland training is structured into the annual plan as a whole. For instance, it was of particular interest to discuss the relationship between dryland training and on snow training. Therefore, only one decision category is defined for this class: The structure of dryland training.

8.2 Determining the Structure of the Dryland Training

One important set of decisions a coach must make in developing the annual plan is how to structure the various forms of conditioning training into the preparation period. In this connection, five sub decision categories were defined on the basis of the interviews. Similar to the structure of on snow training, sub decision categories

were identified for both the distribution and length of dryland training periods. However, some sub categories unique to dryland training were also defined. While all on snow training is completed in camp situations, dryland training takes place both where the athletes train at home, alone, as well as in camp situations. Thus, it is necessary to understand how coaches plan when to have these camps as well as what types of activities are planned for them. Therefore, there were two sub decision categories defined representing the contents of training at dryland camps and the distribution of dryland camps in the preparation period. Finally, of special interest were the philosophies of conditioning coaches regarding what types of conditioning to complete during on snow training camps. This gave rise to the fifth sub decision category: The contents of dryland training at on snow training camps.

Determining the Distribution of Dryland Training Periods

The distribution of dryland training refers to when conditioning is completed over the course of the preparation period. The decision variables that the interviewed conditioning coaches referred to in making this determination are presented in Table 8.1.

Interference

It appears that some of the critique of the Classical Periodization Model has begun to gain acceptance among coaches in alpine ski racing. For instance, one of the variables identified by the coaches in determining the distribution of conditioning training was interference. In particular, both the interference between conditioning and technique training (Charniga et al., 1986b; Holmes, 1999; Siff & Verkhoshansky, 1996; Tschiene, 1993; Tschiene, 1995; Verhoshansky, 1996; Verhoshansky et al.,

Table 8.1. The decision variables associated with the sub decision category of determining the distribution of dryland training periods over the course of the preparation period.

Decision Variables
• Interference ⇨ Physical Conditioning and Technique Training ⇨ Training for Maximum Strength and Aerobic Endurance • Conjugate Sequencing

1991; Verkhoshansky, 1985/1988) and that between training for aerobic endurance and training for maximum strength (Hennessy & Watson, 1994; Kibler & Chandler, 1994; Kraemer & Nindl, 1998; Kraemer et al., 1995; Nurmekivi, 1997; Satori & Tschiene, 1988; Tan, 1999; Tanaka & Swensen, 1998) were identified by the coaches as being important to consider.

Physical Conditioning and Technique Training

The coaches emphasized that conditioning and on snow training should be separated into distinct blocks of training. They felt that for highly trained athletes to make improvements in their physical fitness, a relatively prolonged period of hard physical training is required. Furthermore, it is thought that such a demanding period of conditioning results in a significant amount of fatigue which, in turn, can reduce the quality and effectiveness of on snow training. In addition, a couple of the interviewed coaches pointed out that although technique training does have a certain conditioning effect, it is not strong enough to maintain general physical fitness at a high level, much less stimulate an improvement. Hence, these coaches felt that if dryland training is repeatedly interrupted by on snow camps, that very limited improvements in physical fitness are possible:

> *"Also different this year is that we were working a lot more in blocks. Last year, especially when autumn came along, we were skiing pretty much every week, you had the feeling. You went back home for the weekend and then you came back [to camp] again. So, you had a very long period of almost a couple of months of being on the snow pretty much all of the time which I think the fitness out of it didn't actually benefit from it. So, we wanted a good block of skiing, a good block where you could really work on their physical training and then you could really work maximum on both sides."*

To avoid this interference, the preparation period is being divided into distinct periods of conditioning, where there is no on snow training, and periods of technique training, where there is relatively little dryland training (and, of course, periods of recovery). It is thought that such a structure allows for better progress in both conditioning and technical training.

Training for Maximum Strength and Aerobic Endurance

The second instance of interference discussed by the coaches was that between aerobic endurance training and strength training. Thus, some coaches were beginning to separate out dryland training into blocks of unidirectional strength and aerobic training, in a manner similar to the Exercise Physiology Model.

Conjugate Sequencing

One important issue related to Verkhoshansky's (1985/1988) concept of conjugate sequencing came out during the interviews. According to some of the dryland coaches, it is important to organize dryland training to prepare the athlete physically for the demands of technique training:

> *"How do we set ourselves up to go here and get the most out of that camp?"*

This view of the relationship between physical training and technical training is similar to that of the Exercise Physiology Model in that a block of dryland training is used to prepare the athletes physically for a subsequent block of technique training (Charniga et al., 1986b; Dick, 1975; Lehmann, 1997; Siff & Verkhoshansky, 1996; Verhoshansky, 1995; Viru, 1995). As one coach indicated, it is important that athletes are in good enough condition

that they can tolerate a substantial load of technique training:

> *"If you can't last for six to eight runs, why are we going? If you are going to die after the fourth run ... Boy, that price that I am paying for is twice as much."*

However, in describing the training of technique against the background of the LLTE, I believe that Verkhoshansky meant more than just being in good enough shape to train. He meant that an athlete's technique when he is in a high degree of specific physical fitness is significantly different from when he is in a poor degree of specific fitness, particularly in terms of maximum strength and speed. So much so in fact, that technique training should primarily occur when the athlete is in a high level of specific fitness. One of the head coaches seemed to show tendencies of this philosophy in one of his statements:

> *"For those that need to gain muscle mass, the earlier they get that on their body so that they can use it for skiing,* ***then we can train the skiing portion with the machine they are going to have [in competition]. Otherwise, you train with something that they are not going to have later on*** *[emphasis added]."*

If it is important that technique training primarily takes place against the background of a high level of specific physical preparation, then there will be a couple of consequences for the annual plan. For one, it will be necessary to maintain a relatively high level of specific preparation throughout the year. Secondly, periods of technique training should be proceeded by periods of dryland training directed at improving the degree of specific physical preparation.

Determining the Length of Dryland Training Periods

Related to the decision of when to have dryland training is the determination of how long dryland training periods should be. This sub decision category is highly inter-related with those of the distribution of on snow training periods and the length of on snow training periods given on pages 154 and 169, respectively. In determining the length of dryland training periods, the interviewed coaches described three decision variables (Table 8.2).

Dryland Training Periods Should be Long Enough to Obtain a Stable Training Effect

First, coaches felt that dryland training periods should be long enough for a stable training effect to be obtained, in agreement with the literature (Nurmekivi, 1997; Plekhov, 1991a). Periods that are too short do not allow time for enough conditioning to be completed for stable improvements to occur. One of the conditioning coaches felt this was a problem for his team, as illustrated in the following quote:

> *"The big thing that I think is having blocks of time in between on snow camps that allow for proper cycling and periodization. And, in a lot of cases, we jam in on snow situations close together where the time in between is not realistic. It does not follow a proper cycle. Things get cut short. Things are rushed. And the athletes don't get the proper amount of time to go through the phases for the proper adaptation. And this is where I feel that there is a problem. That the ski camps need to be separated enough to where the cycles can be done in a proper way ... To where the athlete can benefit from it the most."*

Some of the coaches indicated that in order to make significant improvements in dryland, at least a four to six week long block is necessary. This is similar to

Table 8.2. The decision variables associated with the sub decision category of determining the length of dryland training periods

Decision Variables
• Dryland Training Periods Should Be Long Enough to Obtain a Stable Training Effect
• Dryland Training Periods Should Not Be So Long that Productivity Diminishes
• The Distribution of On Snow Training

recommendations in the literature (Brunner & Tabachnik, 1990; Holmes, 1999; Maglischo, 1993; Verhoshansky, 1996). It is felt that anything less is not enough time to obtain a stable training effect.

Dryland Training Periods Should Not Be So Long that Productivity Diminishes

While dryland periods should be long enough to achieve a stable training effect, they should not be so long that the productivity in training drops, again in agreement with the literature (Nurmekivi, 1997; Verkhoshansky, 1985/1988; Viru, 1990). Once the productivity of training begins to drop, it is felt that the training program should change focus. This perspective of having dryland periods long enough to obtain a stable training effect and not so long that productivity diminishes is very similar to the concept of the exploitation of the athlete's CAR described in the Exercise Physiology Model (Satori & Tschiene, 1988; Verhoshansky, 1995; Verhoshansky, 1998; Verkhoshansky, 1985/1988; Verkhoshansky, 1996).

The Distribution of On Snow Training

Whether long or short periods of dryland training are completed depends on the time of year. Dryland training is typically the priority in the annual plan in the early preparation period, i.e., from May to August. Accordingly, relatively long blocks of dryland are planned for that time. On the other hand, in the second half of the preparation period, from August to November, on snow training is the priority. At this time, breaks between on snow periods are minimized so as to allow for maximum carry-over from one period to the next (See The Fall: Timing On Snow Training Periods to Maximize Both Training Opportunity and Carry-Over, p. 162). Consequently, dryland periods are very short in the Fall and often amount to only recovery and maintenance training.

Determining the Contents of Training at Dryland Training Camps

The contents of training at dryland training camps is the sub decision category representing the choices of which training methods and activities to include at conditioning camps. Five decision variables conditioning coaches consider were identified from the interviews. These are listed in Table 8.3 and discussed here.

The Emphasis of the Conditioning Program at the Time of the Camp

Perhaps the most important variable that the conditioning coaches considered in determining the contents of training at conditioning camps was that of the emphasis of the conditioning program at the time in question. The interviewed coaches felt that the training at a conditioning camp should fit into the overall progression of the annual plan. In this regard, conditioning camps are sometimes used to introduce a new phase of physical training so that the athletes are familiar with the new goals and training methods. This was particularly important if the conditioning camp immediately proceeded a period of time where the athletes would be training by themselves.

Have a Theme for the Camp

Some of the conditioning coaches described having special themes for their dryland camps. These themes were typically something unique to provide the athletes with variety in their training and extra motivation to train hard.

> *“Sometimes, I would make a theme, like a mountain bike trip or track and field ... or a joint camp with another sport. There are all these tricks that you have to try out.”*

Table 8.3. The decision variables associated with the sub decision category of determining the contents of training at dryland training camps.

Decision Variables
• The Emphasis of the Conditioning Program at the Time of the Camp
• Have a Theme for the Camp
• Activities that the Athletes Can't Do at Home
• Activities that Help to Develop a Positive Attitude
• Educational Activities

Activities that the Athletes Can't Do at Home

The conditioning coaches also liked to include activities athletes normally cannot do at home due to a lack of training partners or special facilities. For instance, one of the conditioning coaches said that a number of his athletes lived in relatively remote areas where it was not easy for them to find training partners. While it is possible for them to train intervals on a track or in the forest, it is not possible for them to play team games. Thus, to motivate the athletes, he liked to utilize different team games at camps to train anaerobic endurance as opposed to running laps on a track.

Two additional types of activity important to include at conditioning camps are physical testing and any training that requires special equipment or supervision from the coaches. One such activity requiring close supervision is coordination training. Variety and challenge are two key aspects of this type of training which can be difficult for the athlete to achieve when they are on their own or do not have access to specialized equipment.

Activities that Help to Develop a Positive Attitude

The conditioning coaches also liked to plan activities at dryland camps to help create a positive atmosphere in the team. Such activities included, for example, special games and team building exercises:

> *"... We were here in the end of September, we were in Italy at the sea. And it was great because we were alone. We trained very good. We did a lot of games which we have never tried before. It was good for a positive mental outlook."*

Educational Activities

In addition to physical training at dryland camps, coaches also include a variety of educational activities. For example, lectures on various aspects of training theory, training methods, nutrition, and dealing with the news media are typical examples of educational activities at dryland camps. Furthermore, individual meetings with the athletes are often planned to review training logs, testing results, goals, and training plans.

Determining the Distribution of Dryland Training Camps

The distribution of dryland camps refers to when they are planned over the course of the preparation period. The conditioning coaches described two important decision variables for this sub category, which are listed in Table 8.4 and presented here.

Constraints: The Importance of Minimizing the Stress of Travel

As discussed previously, the amount of travel an elite alpine ski racer must undergo over the course of a year is extreme. It is important that conditioning camps are timed to minimize the stress of travel. For example, if a conditioning camp is planned such that it falls two weeks before an on snow period, the athletes may have to travel to the conditioning camp, then travel home for only a few days before travelling once again to the on snow camp. A great deal of travel stress results, particularly for athletes who must travel great distances to camps. In such cases, it is better to plan conditioning camps for the middle of a long conditioning block.

Alternatively, conditioning camps can be connected to on snow training camps. As one of the head coaches pointed out, it often worked out best to attach dryland camps to the end of an on snow training camp:

Table 8.4. The decision variables associated with the sub decision category of determining the distribution of dryland training camps.

Decision Variables
• Contraints: The Importance of Minimizing the Stress of Travel • The Structure of the Dryland Training ⇨ The Structure of the Training Load ⇨ The Timing of Major Changes in the Primary Emphasis of Dryland Training

Int: "Would you ever attach a conditioning camp onto a ski camp at the beginning or end?"

Sub: "Oh, yes. I mean, the ideal, what I found, is to do the conditioning part after the skiing because then you can go hard and you don't have to have a break in between. But if for some reason that was not possible, then we would do the conditioning first and then have to take a break between the conditioning and the skiing. I guess that is mostly why it is better to have the conditioning right after the skiing is because we didn't lose a day just sitting around. We took a travel day to the new place and then we got going right away."

The Structure of the Dryland Training

In addition to minimizing the stress of travel, conditioning coaches also consider the structure of the dryland training in the annual plan when deciding when to have conditioning camps. This variable is important in two different ways.

The Structure of the Training Load

First, it is important to consider when there are heavy and light training periods of conditioning planned. For instance, when a conditioning camp is planned for the middle of a conditioning block, it is common to time it with a very high load week. This is effective in that the coaches can monitor the training and the athletes can push each other. However, as one of the interviewed coaches pointed out, this is not the only alternative:

"The thing that would actually be ideal is to have camps at different cycles. So, like maybe the first camp would be a low-recovery week theme. So, an athlete will understand when they get their program, the low-recovery week theme, what that means and how that is supposed to feel. And then,

another camp could be a medium week. They know what a medium week means and how it is supposed to feel. And a medium-high week, and a high week. They need to know the difference between a recovery week and a high week."

A number of the coaches felt their athletes did not take the time to recover. This has a negative effect on the quality of their training during high load periods (See p. 218). One of the conditioning coaches suggested that for groups of younger, highly driven athletes, timing a conditioning camp with a recovery period may be a good opportunity to teach them the importance of recovery and the kinds of things to do during a recovery period.

The Timing of Major Changes in the Primary Emphasis of Training

Also in connection with the structure of the dryland training, one coach indicated that he liked to have conditioning camps timed with major changes in the focus of the conditioning program. In this way, he could check in with the athletes to see how things are going and to introduce the next period of training by describing the goals of the period and teaching them any new methods or exercises:

Int: "How did you go about deciding when to have these [dryland] camps?"

Sub: "Normally, it is when I change the program. So, for me, the finish from the first period and the beginning of the next period for strength. You can show them other things that they have to try to train. To teach them new exercises."

Determining the Contents of the Dryland Training at On Snow Training Camps

The sub decision category of the contents of the dryland training at on snow training camps refers to the choice of what types of conditioning to complete during ski training camps. On the basis of the interviews, a number of decision variables were defined in this regard. These are presented in Table 8.5.

The Goals of Dryland Training at On Snow Training Camps

One of the primary variables to be considered in determining the contents of dryland training during on snow training periods is the role that the conditioning plays in the athlete's preparation at that point. The coaches identified several different goals in this regard.

Maintain Physical Fitness

One of the obvious goals of conditioning at ski camps is to maintain the physical conditioning level. There are only relatively short periods of time between on snow training periods during which an athlete must meet his conditioning goals. It is therefore important for athletes to be able to come home from a camp and, after an appropriate recovery period, begin physical training without having to spend too much time building back up to their previous conditioning level. Thus, components of the overall-conditioning program at that point of the preparation period should be included during on snow camps:

> *"I think that one of the things that is necessary is that it is absolutely essential that you continue to do elements of the workout. You still need to go through full ranges of motion that they will be going through when they leave the camp, because it is going to be very important for them to be able to go right back into the weightroom on*

Table 8.5. The decision variables associated with the sub decision category of determining the contents of dryland training at on snow training camps.

Decision Variables
• The Goals of Dryland Training at On Snow Training Camps ⇨ Maintain Physical Fitness ⇨ Take the Mind Off of the Skiing ⇨ Check Out What the Athletes Have Been Doing ⇨ Supplement the On Snow Training ⇨ Prepare for the Competition Period
• The Contents of the On Snow Training
• The Importance of the Quality and Effectiveness of the On Snow Training
• The Length of the Camp
• The Emphasis of the Conditioning Program at the Time of the Camp

> *a full-time basis when they get home. And they cannot get sore. I mean, they have to be able to continue to do exactly what they should be doing."*

Take the Mind off of the Skiing

Another important goal of conditioning at ski camps is to help the athletes relax and take their minds off of the skiing. The training takes on a recovery role where the focus is on keeping the athletes fresh, motivated, and in good spirits.

Check-Out What the Athletes Have Been Doing

A third goal of the conditioning training is to check the athletes' progress with their conditioning. This is particularly important for teams whose athletes must train for long periods of time on their own. This check-up is not necessarily limited to formal tests. By simply including some activities similar to what the athletes should have been doing at home, a conditioning coach can subjectively evaluate if the training has been done:

> *"You have to evaluate what has been going on a little bit. I think that is important. The conditioning ... the type of emphasis that we can tell whether or not we have been getting the conditioning work out of our athletes. And you can tell immediately if that has been going on. And the only reason that it is important is that there is maybe a chance at these camps where you can kick a guy in the rear and get him going before it is too late."*

Supplement the On Snow Training

A goal of conditioning training at on snow training camps may also be to enhance the quality of on snow training. Obviously one component of this is using activities to

enhance recovery. In this role, the purpose of conditioning at on snow training camps is to help the athletes get ready for the next day. But one of the coaches hinted that dryland could take a more active role in supplementing the quality of on snow training:

> *"... I feel like skiing, although we talk about it as being dynamic, it is not dynamic in the way their movement ... or their range of motion in the body parts is not dynamic. It is basically a static sport. I mean, yes, you want to be as dynamic as possible, but still you are static. So, I think that when there is that much of an emphasis on static type of movement on snow, it is really important to bring in things [to dryland] that are more dynamic ... Coordination training, whether it is by cross training in other sports or whether it is by doing specific coordination exercises ... both the physical load is low enough that it is not going to adversely impact the potential for the athlete on snow to maximize their training time ... and also because of the broader range of movement can help to keep the athletes more fluid, more athletic, looser when they are on snow."*

The use of coordination training in this manner might be thought of as a good example of technique supplementary training as described by Martin (1992).

Prepare for the Competition Period

For on snow camps immediately prior to the competition period, one important goal of the conditioning is for the athletes to practice preparing themselves for races. One conditioning coach described this goal in the following manner:

> *"I try now, at this time [November] ... I say, 'OK, now you have time to prepare for a race. You train to prepare for a race now.' So, they think, 'OK, this morning I take free. And then prepare for the afternoon. I have a race. It is training, but I think that I have a race or I am*

preparing like so.' We have training now for that. So, they feel, 'OK, I have to do more jumps.' Or, 'I have only to walk a little or to run a little.' It depends. From athlete to athlete it is different."

The Contents of the On Snow Training

The second variable considered in determining the contents of dryland training at on snow training camps is the contents of the on snow training. In particular, it is important that conditioning coaches adjust the physical training at a camp according to the type of on snow training being completed. For instance, one of the head coaches described including endurance training in dryland when the on snow training consisted of only short courses. Also, conditioning coaches try to make up for any missed on snow training. An on snow training camp has an impact on the physical conditioning of an athlete that is important in the overall progression in training over the course of the annual plan. If many days of on snow training are lost – due to bad weather, for example - then it is important for the conditioning coach to replace the lost skiing with dryland training so as to maintain the training load. This is related to the Principle of Continuous Load Demand (Berger et al., 1982; Bowerman & Freeman, 1991; Freeman, 1989; Matveyev, 1977/1981).

The Importance of a High Quality and Effectiveness of the On Snow Training

It is critical the athletes are not so fatigued from conditioning training that the on snow training is impacted. One of the coaches felt that the key is to not overdo the volume of dryland training. He described how if you do overdo it, then you can see that the level of skiing is not as high as it should be the following day, which is a shame when you have the chance to ski. This is

perhaps especially true for the last part of the preparation period, as pointed out in the following quote:

> *"The conditioning at that camp [November] is really very individual. We listen to the athlete, how they are feeling. We make judgement calls on if they are tired on snow. We want to keep the snow quality time really high and really intense at that camp. If that means very light conditioning, that is what is going to happen."*

The Length of the Camp

The types of conditioning completed are also dependent on the length of the camp. If the camp is very short, conditioning is cut down to a bare minimum. There is no need to include dryland for maintenance purposes. However, if the camp is long, it is felt that some maintenance dryland should be included in the training.

The Emphasis of the Conditioning Program at the Time of the Camp

The interviewed coaches felt that the conditioning completed at on snow camps should fit into the particular phase of training that the athletes are in at that time of the annual plan. It has to fit in with what they are trying to accomplish as far as the whole conditioning program is concerned:

> *"I think that the camp goals as far as conditioning is concerned should fit in with what the general conditioning program emphasis is at that time."*

8.3 Summary

This chapter reviewed the planning of dryland training during the preparation period. Only one decision category could be defined on the basis of the interviews, the

structure of dryland training. A total of four sub decision categories were defined for this category.

The distribution of dryland training periods refers to when dryland training is completed over the course of the preparation period. Two factors which the coaches considered in this connection are interference and conjugate sequencing. In general terms, it seems that the early preparation period is focused primarily on skiing, the early to middle preparation period on conditioning, and the late preparation period on skiing again.

A second sub decision category refers to determining the length of dryland training periods. Coaches felt that dryland training periods should be long enough to allow time for a good period of training and yet not so long that a drop in productivity occurs.

Determining the contents of training at dryland training camps is yet another important sub decision category. The conditioning coaches described a number of things that they considered in this regard including the emphasis of the training program at the time of the camp; activities that the athletes can not do at home; activities that help to develop a positive attitude; and educational activities.

The fourth sub decision category is determining the distribution of dryland training camps. In this connection, it is important to time training camps so as to minimize the stress of travel. Dryland coaches also consider the structure of the training load – i.e., when there are heavy and light load weeks in training – and the timing of major shifts in the focus of training when planning dryland camps.

Finally, a sub decision category was created for determining the contents of dryland training at on snow

camps. In this connection, a number of goals of the dryland training were defined including maintaining physical fitness, taking the mind off of the skiing, checking-out how well the athletes have been doing, and supplementing the on snow training. In addition, it was important that the conditioning program at a ski camp is adapted to what is happening out on the hill. It was critical that conditioning does not interfere with the quality and effectiveness of the on snow training. The length of the training camp was also considered in determining the contents of dryland training. Finally, it was thought that conditioning activities at on snow camps should fit in with the emphasis of the conditioning program at the time in question.

CHAPTER 9. THE PLANNING OF RECOVERY IN THE PREPARATION PERIOD

9.1 Introduction

The importance of major recovery periods in the annual plan was emphasized so strongly by the interviewed coaches that I felt that it should be represented as one of the classes of decision categories. In this class, only the planning of major recovery periods in the preparation period are discussed (i.e., recovery periods greater than one to two weeks in duration).

Three primary reasons for major recovery periods were emphasized during the interviews. First, the interviewed coaches seemed to agree with the Principle of Moderation (Bowerman & Freeman, 1991; Dreschler, 1998) in that they felt that it is important for a person's psychological health to maintain a balance between the various aspects of his or her life.

In particular, they felt it important to maintain a balance between an athlete's sporting career and their personal life. Because ski racers must spend so much of their time travelling, the interviewed coaches felt it particularly important to allow athletes to have time with their friends and family when there was the opportunity to do so.

In addition to having time at home, two of the interviewed coaches felt it important that athletes have the opportunity to begin preparing for life after their competitive careers. They explained that the majority of athletes do not earn enough money ski racing to support themselves, much less establish economic security for their futures. Therefore, when creating the year plan, these coaches felt it necessary to give the athletes time to pursue personal development activities such as academic studies or internships:

> *"... We don't work with people where we provide their entire living situation that they would be comfortable with. Somebody that doesn't make any money ... then you have to still provide a situation where that athlete can go to school ... to be able to have a career. 'What if this doesn't work? What if I am not the one? If I don't have enough talent to go through this?'"*

Second, the coaches indicated that major breaks between on snow periods also give the athlete the chance to step back and refresh their perspective on their athletic career and to rekindle their motivation. Even the most driven and motivated of athletes may tire mentally from being in the same white, cold environment of alpine ski racing the entire year round. Refreshing one's perspective and motivation is particularly important to maintain a high quality and effectiveness of technique training (Christina, 1988; Major & Svendsen, 1995; Schmidt, 1999; Schröder et al., 1982; Stein, 1998; Aamodt, 1999). As one of the coaches said in their interview, to accomplish this, it is necessary to give the athletes a long break from on snow training at some point in the year:

> *"It is important to refresh their mental outlook ... I think that a long break is necessary just to create a positive frame of mind that is going to*

be open to learning and have an opportunity to make some improvements.”

Moreover, athletes at this level must spend extended periods of time eating, sleeping, travelling, training, and competing with the same group of people. The coaches felt an extended break is also important to be away from the other members and staff of the team for a while.

Finally, over the course of the competition period, there is relatively little recovery time and a variety of minor physical injuries - such as sore feet, knees, and backs - can accumulate. While these injuries are not necessarily career threatening, they do limit what the athlete can do in training. The interviewed coaches stressed the importance of giving enough rest so that these injuries have time to heal.

One decision category was defined for planning recovery in the preparation period: The structure of recovery.

9.2 Determining the Structure of Recovery

The structure of recovery in this thesis refers to the coach’s decision of when to have major recovery periods in the annual plan. In this connection, four decision variables were defined based on the interviews (Table 9.1).

The Distribution of On Snow Training

One of the more important decision variables for the structure of recovery is the distribution of the on snow training. In both the Classical Periodization and Exercise Physiology models, a major period of recovery - the transition period - is planned for between the end of a competition period and the beginning of a new

Table 9.1. Decision variables associated with the decision category of determining the structure of recovery in the preparation period.

Decision Variables
• The Distribution of On Snow Training
• Competition Selection
• The Timing of Sporting Form: Taking Advantage of the LLTE
• It is Difficult But Important to Rest When Catching Up

preparation period (Berger et al., 1982; Bowerman & Freeman, 1991; Dick, 1975; Dreschler, 1998; Freeman, 1989; Kibler & Chandler, 1994; Matveyev, 1977/1981; Siff & Verkhoshansky, 1996; Woodman & Jarver, 1991). However, according to the interviewed coaches, there has been an increased amount of on snow training being completed earlier in the Spring – right after the competition period - in recent years. This is due primarily to the relatively good on snow training opportunity at that time of the year and the desire to maximize the effects of carry-over from the competition period (See Carry-Over from the Previous Competition Period, p. 159, and The Spring: Taking Advantage of the Good Training Opportunity, p. 161). As a result of this shift in the distribution of on snow training, the typical transition period in the Spring has been considerably shortened. The major recovery periods in the annual plan are instead being timed for when the on snow training opportunities are relatively low, such as in the middle of the Summer.

Some of the coaches found that such a shift in the distribution of on snow training may lead to problems, however. Because June and July are typically hard conditioning periods, it is difficult to plan a block of recovery at that time. Consequently, there may not be an extended break from training – both physical and technical training - included as a part of the annual plan. The interviewed coaches stressed that this can have a variety of negative consequences. From a psychological perspective, such a strategy may lead to burn out, as one of the coaches pointed out in the following quote:

> *“... I am seeing a trend of athletes starting the preparation period burned out. Instead of having them going, ‘I am fired up! And I want to be here and I want to work hard!’”*

From a physical perspective, the lack of a prolonged recovery period results in injuries not healing. As a consequence, athletes are limited in the training that they can do. Dick (1975) observed that “should the athlete commence the preparation period without a full recovery from the previous competition season, the effect of future loading will be extremely limited, adaptation problems would quickly arise, a risk of injury would occur, and the disappointment of poor progress in training would have effects reaching into the next competition period” (p. 1969).

Perhaps a solution would be to vary the amount of on snow training and recovery in the Spring each year. For instance, while there might be a lot of skiing and very little recovery one year, there would be more recovery and less skiing the next year.

Competition Selection

Often in the Spring, there are numerous lower level races in which athletes have the opportunity to participate. With the increased amount of on snow training early in the preparation period, the decision to participate in these late season competitions becomes critical as it can shorten the already limited volume of recovery at that time. As one coach indicated, this can become a problem if not accounted for in planning:

> *“Some of it is self-induced because there was a carrot out there saying, ‘Come to these races and we will pay you X amount of money.’ And some of these girls go, ‘Sure, I could use a little extra cash.’ And so they go to the race and they get treated like queens. They get some extra cash. Everything is paid for. And they are the big dogs so they feel real good. And they do that and then all of a sudden, they just get their shoes off and it is time to pack their bags and go to the next camp.”*

One suggestion to increase the amount of recovery time in the Spring and still take advantage of the good opportunity at that time, is to have on snow camps planned at the same time and locations as these late season competitions. In this way, the races become a part of the training or testing.

The Timing of Sporting Form: Taking Advantage of the LLTE

One of the interviewed coaches described timing major recovery periods so as to improve the quality of technical training. In this regard, recovery periods were planned for after heavy conditioning blocks and before on snow training periods (Figure 9.1). This allowed for the technical training to be completed against the background of the supercompensation in sporting form caused by the heavy dryland training.

> *"This is the thinking that you have now a long period of training behind you. Especially in the strength training, you build down pretty much. And then, if we should start skiing here [right after the end of the strength training block in Figure 9.1], you have a very lot of days lost. And if it is a very hard camp here ... I don't think that we can do this. We are down here [where sporting form is at its lowest in Figure 9.1]. So, therefore, we have two weeks off. So, we are up here again. Then we really can work good here."*

This is very similar to the strategy of taking advantage of the LLTE as described in the Exercise Physiology Model (Verkhoshansky, 1985/1988).

In connection with the timing of performance, the coaches expressed it as particularly important to come into November fresh and motivated to ski. From November on, there is a long period of time with a high level of physical and psychological stress. As a consequence, some

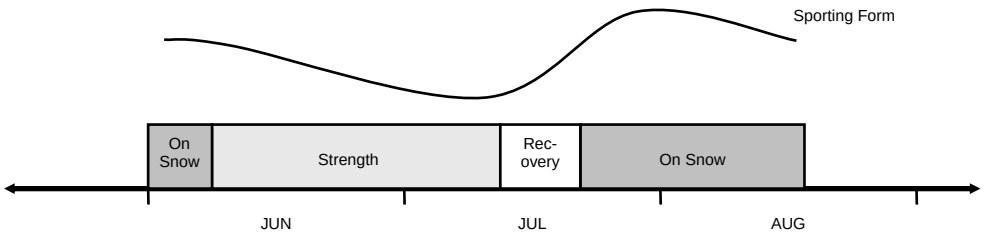

Figure 9.1. An illustration of how conditioning, recovery, and on snow training are organized to take advantage of the LLTE. The diagram is modified from a sketch made during one of the interviews.

of the interviewed coaches felt it critical to include recovery periods in the Fall. As an example, one of the head coaches described how he made sure to include a full three weeks of recovery following what was typically a very heavy block of on snow training in late August. This gave both the athletes and the staff a break before the final on snow training periods and the competition period.

It Is Difficult but Important to Rest When Catching Up

One challenging variable in planning recovery that the coaches described is the difficulty of resting when there is a feeling of being behind the other nations. This could happen, for instance, when some of the Summer on snow training is lost due to poor weather conditions, something which is not uncommon. This, in turn, leads to the feeling among the coaches and athletes of the need to cram in training in the Fall at the expense of recovery periods. This is a dangerous situation that one of the head coaches described in the following way:

> *"For me, it is always important that you think about training hard, racing hard, but also resting hard. To keep these three in balance is very easy when things are going well ... when you have good conditions, no injuries, and just good results. Then you don't get nervous taking breaks. But when you are struggling and you lose some days or you get half days, you think that you are behind the ball. Then it is tough to take a break. That is when in your planning that you need to be very careful that you can control that. Otherwise, all of the time you end up just in an injury situation."*

Therefore, even when there are unexpected changes in the training schedule, it is important to keep a more long-term picture in mind and maintain recovery in the plan. To not do so may endanger not only the health of the athlete, but also their career:

“It is common that when you are behind the ball, you try to catch up, and you just get blind. And you overdo it. It can ruin a career.”

A related problem some coaches described is that their athletes have a difficult time taking a break from training, **even when a recovery period is planned**. One coach stressed the importance of these athletes learning how to allow themselves to recover so when it is time to train hard, they will be motivated to give their full effort and focus.

9.3 Summary

To summarize, major periods of recovery are an important component of the annual plan. Athletes need time to take care of their personal life, to refresh their motivation for training and competition, and to heal any nagging injuries. On the basis of the interviews, one decision category was defined for this class, namely the structure of recovery.

In considering how to structure recovery into the preparation period, the interviewed coaches considered a variety of factors including the structure of the on snow training, competition selection, and the LLTE. In addition, they emphasized the importance of maintaining adequate recovery periods in the plan even in light of lost training or poor results.

CHAPTER 10. THE PLANNING OF EQUIPMENT TESTING IN THE PREPARATION PERIOD

10.1 Introduction

The final class of decision categories for the preparation period represents the planning of equipment testing. The development, testing, and preparation of equipment for competition is an issue which is rarely addressed in training theory textbooks. Nevertheless, according to the interviewed coaches it is an essential aspect of the preparation of elite alpine ski racers:

> *"[Equipment testing] is, in my mind, as important as conditioning planning and conditioning follow-through and how it is carried out. And because we are a sport which is heavily oriented towards equipment - not only towards skill and conditioning but also towards equipment - that should be in the plan."*

Each year, time must be set aside for testing, selecting, and adjusting equipment – skis, boots, bindings, plates, etc. – for competition. This is often a process that takes place over the course of the entire year.

On the basis of the interviews, two decision categories were defined for equipment testing: The contents of equipment testing and the structure of equipment testing. This chapter is thus divided into two sections. In the first section, A Description of the Contents of Equipment

Testing, several different forms of equipment testing as described by the interviewed coaches are defined. Some of the characteristics of equipment testing methods identified in this section have important implications for the design of the annual plan. Then, under Determining the Structure of Equipment Testing, some of the decision variables that coaches consider in deciding how to structure equipment testing into the year plan are identified and discussed.

10.2 A Description of the Contents of Equipment Testing

The term “equipment testing” by itself is actually a very general term describing a relatively broad range of different activities. For instance, testing can have a variety of different goals ranging from assisting in the selection between different brands of equipment to glide testing different waxes and base structures in preparation for a specific race. Additionally, equipment testing can vary in the degree to which “scientific” methodology is used. In some forms of testing, a relatively controlled environment is established with the goal of obtaining objective feedback on the performance of the equipment. In other cases, the focus is more on how the athlete subjectively perceives the equipment to perform.

Based on the primary aims of testing as described by the interviewed coaches, three types of equipment testing used in the preparation period can be differentiated: Equipment selection testing, equipment development testing, and equipment set-up testing.

Equipment Selection Testing

Equipment selection testing is when an athlete tests similar equipment to decide which versions to use in

competition. For instance, this type of testing is necessary in periods when an athlete's contract with one equipment manufacturer ends and he has the option of entering into new contracts with other companies. In such a case, a special testing period is usually planned where the athlete would test equipment from different companies to determine which brand to use in competition.

Equipment Development Testing

The second variant of testing, equipment development testing, has the primary aim of evaluating new forms of equipment for research and development. On World Cup teams, some of the athletes are the number one athlete for an equipment manufacturer. For these top athletes, there is testing of new products from the ski industry throughout the year under both formal and informal settings.

> *"There is an on-going thing with elite teams in Europe where the companies always bring new skis. You don't really get that in the United States. But in Europe, they always bring in new things at a camp. It is like a Formula 1 driver going into the pits. And then at the end of the camp he says, 'You know, I really didn't like this sidecut. Maybe until the next camp give it another try. Take a little bit away from the tip of the ski just to make it a little bit shorter.' Or whatever they can do within the company to adjust. And then they bring in the new skis for the next camp."*

This type of testing is particularly important for the further technical development of the very top athletes. These athletes are at the highest levels of technical mastery and are pushing to develop new forms and variants of technique. For them, the development of equipment and the evolution of technique go hand in hand. Hence, this on-going, equipment development testing is an integral

part of their on snow preparation and should be planned for as such.

Equipment Set-Up Testing

Equipment set-up testing, the third variant, refers to testing with the aim of adjusting the set up of the equipment. This includes testing such aspects as the tune on the skis, wax testing, boot adjustment testing, etc. As one head coach explained in the following quote, this type of testing occurs on almost a daily basis:

> *"Every single athlete that has a chance to win medals or is a medal winner is in the ski room every day and talks with the service people every day. And gives them feedback about how the skis are performing and what he thinks they should change in tuning."*

Equipment set-up testing is completed in both formal test situations, where the purpose is to obtain an objective measurement; and in less controlled situations, where the aim is to gain a subjective impression. This might be done in normal training or in races completed with the purpose of testing.

10.3 Determining the Structure of Equipment Testing

The second decision category in this class is the structure of equipment testing. This decision category reflects the choices coaches have to make when planning when to have equipment testing over the course of the preparation period and how to fit this together with the technical training. The decision variables that were identified in the interviews are presented in Table 10.1 and discussed here.

Table 10.1. Decision variables associated with the decision category of determining the structure of equipment testing in the preparation period.

Decision Variables
• Minimize Interference with Technical Training
• The Rules of the Federation Ski Pool
• The Equipment Manufacturer: Design & Distribution Schedules
• Training Opportunity
• The Start of the Competition Period

Minimize Interference with Technical Training

According to the interviewed coaches, it is easy to get side-tracked with respect to equipment testing. Indeed, it does not take much to disrupt the progression of technical training over the course of the preparation period. Thus, it is important to minimize the interference of testing with technique training. In some cases, this means separating testing and training into different periods. This is especially important for equipment selection testing which is often completed as early as possible in the Spring at camps specifically planned for such testing. In this way, at least the brand the athlete will be competing on will be decided early in the technical training. As one of the ski coaches pointed out in the following quote however, separating technique training and equipment testing can be problematic:

> *"We try never to sort of confuse training and testing. If we have to test, we try to do that in very specific testing camps. I think that sounds good in theory, but it doesn't always work out that way because all through the season you do have some new skis that come out or you have someone with some sort of problems that you have to look at testing-wise. So, it could be that one or two skiers are testing while the others are training. But we try to ... and that is federation policy ... that you try to keep that apart."*

Hence, it is important to be systematic in incorporating testing into the annual plan. This requires extensive communication with the ski manufacturers and equipment technicians. The goal is to determine what testing needs to be done and how to fit it into the annual plan so that it does not interfere with the technical progression, and maybe even enhances it.

Staying focused on the technical progression – and not getting distracted by equipment testing - may be particularly important for athletes of lesser qualification, such as Europa Cup team athletes. For these athletes, technical goals are probably more important. For example, one of the Europa Cup coaches felt it would be a more productive use of time and energy to simply select the equipment which is most successful rather than expend time and energy testing equipment from different manufacturers. At the same time, one of the head coaches felt that equipment set-up testing could be useful at both the Europa Cup and World Cup levels. He indicated that it could be a great learning tool for younger athletes.

The Rules of the Federation Ski Pool

In addition to considering how equipment testing can fit into the technical development of the athletes, coaches must follow the rules of their respective federation ski pool regarding testing. For example, in the United States, equipment selection testing between different manufacturers can only begin after the completion of the last event of the season and must be concluded by August 15th.[11] Additionally, one of the interviewed ski coaches pointed out how often ski contracts are limited to two years by the federation ski pool. This means that every second year a period of time must be planned for equipment selection testing to assist in the selection of a new contract. Consideration must be given so that the rules of the ski pool do not limit the technical development of the athletes.

[11] According to the 1998/1999 USSA Alpine Pool rules.

The Equipment Manufacturers: Design & Distribution Schedules

The timing of when equipment manufacturers develop and distribute new equipment to the teams influences the timing of testing. Ideally, the timing of these schedules should correspond with the training process of the teams. Specifically, if testing is planned for certain periods of time during the year, then – ideally - development schedules should be adjusted so that the equipment is ready for testing at these points. However, this is often not the case. In fact, it is often not known when new equipment developments will come out at the time when the annual plan is made. While it is important that coaches adjust plans to allow for equipment testing, it is also critical that they keep enough of a handle on things that the interference with technique training is minimized.

Training Opportunity

Depending on environmental conditions, equipment can perform substantially different. For instance, the ambient temperature influences the mechanical stiffness of boots and other equipment. In warm temperatures, this equipment is much softer and as a result performs much differently than in colder conditions. Equipment can also be expected to perform differently according to snow conditions, as one of the coaches pointed out in the following quote:

> *“One thing that we have to realize, too, is that in November, when you come to ski on dry, man-made snow - this is the typical snow that we are going to be racing on - the equipment can a lot of times not work the same as it was on the bigger crystal type of snow ... the Spring snow, the salted snow, or the glacier snow.”*

It is therefore important that testing occurs at times of the year when the training opportunity is as close to race

conditions as possible in terms of both the snow conditions and temperature. Consequently, testing is for the most part concentrated in the early Spring, the late Summer if the team travels to the Southern Hemisphere, and the late Fall (See Figure 7.2).

The Start of the Competition Period

Although some equipment testing occurs over the course of the entire competition period, the interviewed coaches indicated that it is advantageous to have the bulk of the testing completed by the end of the preparation period.

> *"The November camp is the first really good opportunity for man-made snow. As hard as we can find. We are also finalizing our testing at this point. We have to get the race skis ready to go. We have to really know what we are going to be on. And that is very important."*

10.4 Summary

In summary, the testing and preparation of equipment is an essential component of the annual plan for alpine ski racers. Two decision categories were identified in this class on the basis of the interviews.

Under the contents of equipment testing, three types of testing were differentiated. In periods where athletes are free to change contracts with equipment manufacturers, testing to compare the equipment of different companies is undertaken. This type of testing, referred to as equipment selection testing, provides both objective and subjective information to assist the athlete in choosing which brand to use in competition.

Testing with the purpose to further advance equipment is defined as equipment development testing. For highly

qualified athletes, the further development of technique goes hand in hand with the development of equipment. Consequently, testing in both formal and informal formats is an on-going, integral part of the development of technique.

Last, equipment set-up testing is used to gain both objective and subjective information about the set-up of an athlete’s equipment. This includes such aspects as the fitting of boots, the tuning of skis, and so on.

The structure of equipment testing is the decision category that refers to how equipment testing is built into the annual plan. Here, it is important that testing is systematically placed in the annual plan in such a manner that it does not interfere with the technical training. Ideally, the equipment manufacturer’s design schedules as well as the rules of the federation’s ski pool should be coordinated in such a manner as to facilitate the preparation process of the athletes. Additionally, it is critical that testing be completed at times where the training opportunity is as specific to competition conditions as possible. Consequently, testing is usually distributed into the early Spring, the late Summer if training in the Southern Hemisphere, and the early Fall.

CHAPTER 11. THE PLANNING OF COMPETITION

11.1 Introduction

The first of the four classes of decision categories defined for the competition period is the planning of competition. One of the main tasks of the coach in designing the annual plan is to determine the competitions in which the athlete should participate.

Based on the interviews, two decision categories were defined in this regard including (1) the selection of competitions and (2) the total number of competitions. These two categories, and the decision variables considered by coaches in their planning, are the topic of this chapter.

11.2 The Selection of Competitions

The choice of the competitions in which to participate is one of the fundamental decisions coaches must undertake in creating the annual plan. For the very best athletes in alpine ski racing, the selection of competitions is fairly straightforward, as the main focus for these athletes is the World Cup. On the other hand, for athletes below this level there are a large number of races from which to choose including European Cup races, Nor Am Cup races, and

FIS races.[12] In fact, there are literally hundreds of races from which to choose. These choices are important as they determine the athlete's exposure to opportunity to move up in world rankings. Moreover, selecting races determines the possibilities for athletes to compare themselves with racers of similar or better ability. This can be an important motivational factor:

> *"You have to expose them [the racers] to the opportunities. That means that they have to be at certain races with certain athletes. To be exposed to those athletes and to be in competition with them. You have to expose them so that they can get that feedback and then move on from there."*

Additionally, the selection of competitions is important in terms of planning as it is a factor used in determining the structure of the training year (Berger et al., 1982; Bjørn, 1984; Bompa, 1987a; Bompa, 1999; Bowerman & Freeman, 1991; Kirksy & Stone, 1998; Matveyev, 1977/1981; Pedemonte, 1986b; Viru, 1990). Five decision variables that are considered by coaches in competition selection were identified on the basis of the interviews (Table 11.1).

The Importance of Competing at Different Levels

Similar to the literature (Bompa, 1987a; Bompa, 1999; Matveyev, 1977/1981; McInnis, 1981), one philosophy the interviewed coaches felt important to consider in selecting competitions was that athletes should race at different competitive levels. Here, three levels were

[12]Alpine ski racing competition is split into different levels. At the highest level of competition is the FIS World Cup, Olympics, and FIS World Championships. Below this are the FIS Continental Cups of which the European Cup and the North American (Nor Am) Cup are the most competitive, with the former being more competitive than the later. Below the Continental Cups are numerous international FIS races held throughout the world. How athletes qualify for these races varies considerably depending on the hosting country.

Table 11.1. The decision variables associated with the decision category of competition selection.

Decision Variables
• The Importance of Competing at Different Levels ⇨ The Focus Level ⇨ The Training Level ⇨ The Experiential Level • The Importance of Success: "Winning at All Levels" • The Distribution of Competitions: Allow for Periods of Recovery and Training • Constraints ⇨ Staff, Travel, and Budget ⇨ Responsibilities to Sponsors • Special Considerations ⇨ Qualifying for Major Championships ⇨ What Benefits the Whole Team and Quotas

differentiated. The first two, referred to as the focus level and the training level, are also defined in the literature (Bompa, 1999; Bowerman & Freeman, 1991; Freeman, 1989; Harre, 1982b; Matveyev, 1977/1981). However, a third level, termed the experiential level, is not. The interviewed coaches stressed the importance of maintaining a proper balance in participation in each of the three competitive levels as each level has a different purpose in the development of the athlete.

The Focus Level

The primary level of competition for an athlete is defined as the focus level. This is the level which the literature refers to as consisting of main or primary competitions (Bompa, 1999; Bowerman & Freeman, 1991; Freeman, 1989; Harre, 1982b; Matveyev, 1977/1981). As one coach put it, this is that level of competition at which the athlete is:

> *"a part of the race. They are competitive in that race. They are not at the tail end of that race. They are advancing. And they have the potential to win it as they move through that."*

These are races where the athlete is focused on winning and performing to his very best. Consequently, the year is structured to achieve the best possible performance in the focus level races (Matveyev, 1977/1981). It is important that the focus level is at a high enough level of competition that a successful performance gives the athlete a boost and thereby sets the stage for moving up to the next level. At the same time however, there are problems when the focus level is defined at too high of a level. These will be discussed shortly.

The Training Level

The second competition level is that which is below the focus level and which is referred to as the training level. Competing at this level can have a variety of purposes. For example, in cases where an athlete is not performing to his potential in his focus level, many of the ski coaches described going back to the training level to gain a positive experience and to build self-confidence:

> *"If they have not good enough results, they have a lack of confidence, then you move them back a level. Give them nice, do-good races that you know out of experience will be happening. Good hill. And then they come back and go for it again on the World Cup."*

Competing at the training level can also have the purpose of competition specific training or the testing of equipment. In addition, some of the ski coaches felt that it was important for national team members to participate in lower level races to give younger, developing athletes the opportunity to compete with them.

Similar to the literature (Bompa, 1999; Harre, 1982b; Matveyev, 1977/1981; Matveyev, 1992), the interviewed coaches indicated that training level races normally do not have a special preparation. Rather, the race is often seen as a part of the training process. In fact, some coaches described training before, during, and after the race on the same day.

The Experiential Level

When there is a level of competition above the focus level, then that is referred to as the experiential level for that athlete. If an athlete has done well at his focus level, then he may be given an opportunity, or

exposure, to his experiential level. It is thought that in so doing, the athlete can gain valuable experience at the higher level as well as be inspired to move upwards in his career. In the case of the Olympics or World Championships, this is advantageous in that these athletes will be familiar with the extra "scenery" associated with a major championship and thereby able to focus more fully on winning when the Olympics becomes their focus level.

The possibility of bringing athletes up a competitive level to gain experience is limited to a certain extent by the competitive depth of the nation as a whole. This is particularly true for major competitions such as the Olympics or World Championships. Smaller nations with fewer athletes may have enough open quota spots[13] that they can bring young, promising athletes to an Olympics just to gain experience. On the other hand, in more competitive nations, the competition for obtaining a quota spot may be very great among older athletes who have real chances of winning. In such cases, it is difficult to justify giving a spot to a younger athlete just for the sake of experience.

The Importance of Success: "Winning at All Levels"

Another decision variable that is especially important to consider in selecting competitions is the importance of success. This philosophy, termed "Winning at All Levels" by some of the coaches, refers to the idea that an athlete's progress through the competitive system should be built upon a foundation of success. In other words, an athlete should progress to the next competitive level only after having achieved a sufficient amount of success at the previous level. For instance, an American Europa Cup coach explained how his athletes' performance in the

[13]A quota refers to the total number of athletes from any one nation or team who are permitted to participate in a competition.

January continental cups in North America determined the level at which they would compete on a subsequent trip to Europe. Those who did well would compete primarily on the Europa Cup level; Those who did not would compete in primarily FIS races.

Although this concept may sound somewhat obvious, experience has shown how easy it can be to forget this principle in practice. There are two important and inter-related implications of this philosophy regarding competition selection.

First, the pressure to obtain quick results can lead to athletes being moved up through the competitive ladder too quickly. As a result, they wind up competing at a level where they only experience defeat. This issue was addressed in a published interview with Paul Major (Hampshire, 1990), a former women's head coach in the United States:

> *"The tendency was: You have to get results. You've got to win on the World Cup ... So we took a lot of young athletes, and all of a sudden they were racing on the World Cup. They were ranked 100th in their event, and then they were racing World Cups. All that breeds is acceptance of failure." (p. 4)*

Similarly, one of the ski coaches described a common mistake he has observed in which athletes are moved up through the competitive levels too quickly and wind up spending most of their time competing at what in reality should be their experiential level:

> *"What I feel like is, in almost every case, athletes are spending too much time at the experiential level. The level where they are just getting their butts kicked over and over again. And not nearly enough time at their focus or [training] levels. Both the upward and downward*

mobility from those levels are critical to the development of an athlete. You don't want to leave them at a place where they learn to lose for too long."

It is thought that experiencing failure repeatedly is discouraging and can eventually lead to an acceptance of failure and resignation on the part of the athlete. This may be a problem in particular for nations which do not have many competitive athletes on the World Cup team, for example, but do have a number of young, promising athletes on lower level teams. Such nations may not have very much competition for their quota spots for World Cups and Continental Cups. While this can be positive in that it can give the younger athletes the opportunity to gain experience at a higher level, it can also be dangerous if athletes are moved up too quickly and are constantly competing at too high of a level just because they qualify. Thus, it is critical to identify and concentrate on the appropriate focus level for an athlete.

A second, related implication of the "Winning at All Levels" philosophy is that athletes should achieve success at their focus level before being given an opportunity at their experiential level. In this way, they can take a "slap in the face" at the higher level and still come away from it as a positive experience. One of the head coaches emphasized how he felt that even if the racer is doing really well in training, it is still better to start off by gaining success in focus level races rather than skipping straight to the experiential level:

"If they have done great in training, it is so much different than performing at the race level. I would rather take that positive attitude that they have built up in training and put them in there on the level where they belong and make it pay back there. And then they have that under their belt. After a couple of those, then you can throw them

> *in [at the Experiential Level] and get something out of the experience. I have so many times where I have done that mistake. It seems like you keep forgetting and then you do it again. But I have so many times where it was shown when I did the other way how good it is."*

The interviewed coaches felt that at the beginning of the season, in particular, it is important for athletes to achieve success at their focus level. This success, in turn, acts as a foundation for the rest of the competition period. It is critical to plan the first races of the season carefully.

The Distribution of Competitions: Allow for Periods of Recovery and Training

The interviewed coaches emphasized that it is important to leave room in the competition calendar for periods of recovery and training. In fact, one of the head coaches said that the first things that you look for in planning the competition period are the recovery periods. This topic is addressed in greater detail in Chapters 12 and 13.

Constraints

To conceptually determine the competitions in which an athlete should participate is only one part of competition selection. In addition, coaches must balance the ideal race schedule in terms of the athlete's goals with a number of practical factors. The coaches identified two sets of constraints that they must consider when creating the competition calendar.

Staff, Travel, and Budget

Limited resources in terms of staff, time – due to travel - and budget can restrict the races in which an athlete can participate. For instance, there may not be enough staff to drive athletes around to all the different races

in which they should be competing, as one of the ski coaches pointed out:

> *"The right opportunities are there. They are available. But it becomes a logistical thing. Do we have the man-power and the money? And does it make sense to be racing one weekend on this end of Europe and the next weekend to go over to the other end of Europe for those races? So, it sometimes becomes a logistical issue. Sometimes you have to sacrifice a race or two that fits into your conceptual plan because logistically it is not right."*

Due to these constraints, competitions are often planned using a grouping distribution (Bompa, 1999; Freeman, 1989) in the interest of saving both time and money. As an example to illustrate, American teams will often compete in a relatively large number of races in a short period of time when they travel to Europe.

Responsibilities to Sponsors

In addition to limited resources, coaches must also consider individual and team responsibilities to sponsors when selecting competitions. For instance, at the World Cup level, athletes may be obligated to participate in all World Cup races, even though it may be desirable to skip one or two races in order to have time for recovery. In this regard, it is important to consider the athlete's long-term development when sponsor contracts are negotiated. In particular, one should make sure that contracts do not violate the principles of competing at different levels and "Winning at All Levels."

Special Considerations

The interviewed coaches also pointed out some considerations that apply under special circumstances when selecting competitions. These included the variables of

qualifying for major championships and what benefits the whole team.

Qualifying for Major Championships

The FIS and the International Olympic Committee (IOC) establish rules regarding the total number of competitors from each nation who are allowed to compete in a World Championship or Olympics. Qualification requirements for filling these quotas are then established by each nation's respective federation. Such requirements may include, for example, attaining a certain standard of performance in the World Cups prior to the major championship. Some nations may also use special "Olympic trial" races as a part of these qualification procedures. If an athlete's goal is to compete in a major championship, then it will be necessary to ensure that he or she has the opportunity to achieve the qualification standards as set by the national federation.

What Benefits the Whole Team & Quotas

Each nation is allowed to enter a certain number of athletes in a FIS competition, including World Cups and Continental Cups. This national quota is determined based on such factors as (1) the level of the competition (i.e., Continental Cup, World Cup, etc.), (2) the competitive depth of the nation in question (e.g., the number of athletes ranked in the top 100 on the FIS points list), (3) the country in which the competition is being completed (i.e., larger quotas are allowed for hosting nations), and (4) the number of athletes from the nation meeting personal qualification criteria.[14] National quotas and the rules for their calculation can have a couple of important implications for the selection of competitions.

[14]According to the 1998/99 Rules of the FIS Points, Article 10; 1998/99 Rules for the Alpine Continental Cups, Articles 2 and 5.4; 1998/99 Rules for the Alpine World Cups, Article 3.

First, this limit on the number of athletes from any one nation that can participate in a competition places special importance on an effective communication and cooperation between the coaches of the various teams within a particular ski federation. This means that a coach does not simply have free reign to choose races but must consider what the other teams are planning to avoid exceeding their national quota and consequently having an athlete unable to compete. One Europa Cup coach expressed this in the following way:

> *"We can't be screwing around too much in the FIS races because ____ needs to know for the development program. Because we have a limit. I mean, if he has fifteen guys over there and we show up with six of our guys, that is going to hurt some of his guys. So, we have to talk a lot. We have to keep in line and make sure that we know where we are going to go."*

Second, the rules for calculating quotas for FIS races, Continental Cups, and World Cups reward performance at lower levels of competition. This places increased emphasis on prioritizing performance in focus level races to increase the number of quota spots in higher level races. By competing, and winning, at their focus level, athletes can create more quota spots for the nation at the next level of competition.

Personal Criteria

A couple of the coaches described situations where their athletes had personal criteria that they had to meet by a certain date in order to keep their position on the national team. For example, such a criteria might be that they have to improve their world ranking to better than 80th in the world by a certain date. In such a situation, a coach needs to ensure that athletes with personal criteria have a plan that gives them the opportunity to

achieve these criteria. This also means that one should define criteria that do not interfere with the athlete's development – such as criteria that might provoke race chasing[15], for example.

11.3 Determining the Total Number of Competitions

In planning the competition period, it is important to keep a balance between racing, training, and recovery. Thus, keeping track of the total number of planned competitions is important. In determining the number of races, four decision variables were identified on the basis of the interviews (Table 11.2).

The Long Term Plan

First, it seems that the balance of racing, training, and recovery during the competition period should change over the course of an athlete's career. During the early years of an athlete's career, training is prioritized and the number of competitions is relatively small. Over time, athletes begin gradually competing more and more. At a certain point, competing in a relatively large number of races is seen as necessary for gaining competitive experience and guiding the athlete into the system. For older athletes competing at the highest levels, the number of competitions may decrease once again. At this point, everything is geared to minimize stress and maximize performance at each of the focus level competitions.

The Degree of Specialization

Understandably, the number of competitions will also depend on the specialization of the athlete in question. For one or two event skiers at the highest levels, the number of competitions may be relatively small as one head

[15] See p. 254 for a discussion of race chasing.

Table 11.2. The decision variables associated with the decision category of determining the number of competitions.

Decision Variables
• The Long Term Plan
• The Degree of Specialization
• Experience
• Balance Between Competitive Levels

coach experienced with a top 15 world ranked slalom specialist:

> *“One event skiers ... _____, I think that she had 17 starts last year. That is very, very low. And I was surprised to see her being on such a high level the entire year because of such a low number of starts. That, for me, after 17 years of coaching, is a new thing that I learned. That people are able to do that. They don’t drop off in their results even with that low number of starts all the way to the end of the competition period.”*

The situation is not the same for four-event skiers who are competing for the overall World Cup title. These athletes will be competing in a large number of races just considering the World Cup, Olympics or World Championships, and the National Championships.

Balance of Competitive Levels

A common problem during the competition period seems to be competing in too many events. One of the ski coaches made an interesting point in this regard. He felt that a high number of competitions was not as much of a problem as a poor balance between competitive levels. As long as one has a limited number of focus level competitions, and truly treats experiential and training level races as a part of preparation, then having a large number of competitive starts should not be a problem. Serious difficulties arise when one has fifty competitive starts, each of which is being treated as a focus level event. This significantly reduces the time available for training and recovery.

11.4 Summary

In summary, the planning of competitions is an important step in the design of the annual plan. Two decision categories were defined for the planning of competitions.

The first, competition selection, refers to the choice of which competitions to race. This decision is made based on a number of variables. The interviewed coaches felt it important that athletes compete at different levels of competition. Three levels of competition were defined: the focus level, the experiential level, and the training level. It was also important that athletes achieve success at one level of competition before moving up to the next level. This philosophy is referred to as "Winning at All Levels." In addition, it is important to block out periods of time in the competition program for training and recovery purposes.

In determining the total number of competitions in which to participate, coaches consider the long term plan. At certain points in an athlete's career, it is important to compete in a relatively large number of races to gain competitive experience. In such cases, it is important that training and experiential level races are treated as such and not as focus level races. At higher levels of competition, the coaches become much more selective about which competitions in which to participate. At this point, the total number of competitions may be reduced, especially for one and two event specialists.

CHAPTER 12. THE PLANNING OF ON SNOW TRAINING IN THE COMPETITION PERIOD

12.1 Introduction

The second class of decisions categories defined for the competition period represents the planning of on snow training. This class is further divided into two decision categories, which are described in the following sections of this chapter. In the first section, entitled A Description of the Contents of On Snow Training, some of the aspects of on snow training methods used in the competition period as described by the interviewed coaches are presented. Under the second section, some of the decision variables that coaches use when planning the structure of on snow training in the competition period are discussed.

12.2 A Description of the Contents of On Snow Training

The decision category of the contents of on snow training refers to the determination of what types of methods to use in training. For this category, decision variables were not defined. Instead, some of the main characteristics of on snow training during the competition period identified during the interviews are described.

The Importance of Training is Relative to the Athlete's Qualification

There were somewhat contrasting views of the importance of training during the competition period among the interviewed coaches. Some of the coaches felt that learning new skills or modifying old ones should be relatively limited over the course of the competition period:

> *"If the athlete tries to learn too much during the competition period as far as the technique and tactics go, that means that they probably did not do that during the preparation period. They probably did not put enough effort in to have those problems solved when the time was right. You know, if the muscle memorization is not there, you will not get it through this period of time, the competition period. You are behind, period."*

Conversely, some of the interviewed coaches emphasized the importance of allocating time for technical training during the competition period. One of them made an interesting point of how so much time and money is spent in search of winter snow conditions and terrain during the preparation period, and yet during the winter - when such conditions are readily available - we don't actually take the time to train. The positive impact a training camp during the season can have in the development of an athlete is exemplified in the following quote where a coach re-called one of his experiences:

> *"One of the best things that I have personally been involved with ... ever ... was a training camp that we did at Beaver Creek on the downhill course after the World Cup race there last year. I mean, it was phenomenal. It was absolutely the best thing that we could do. There were some races going on, but we convinced our development level athletes to not do those races and instead do a weeklong training camp. It made the difference in their years, maybe in their careers. ____ ended up making the national team. ____ went on to*

medal at the World Juniors. That was not a level that those guys had skied at before."

Perhaps the reason for this difference in perspective is that the importance of on snow training – and the role that this training plays in the preparation of the athlete – depends on the competitive level of the athlete. For higher level athletes competing to win at the World Cup level, the role of on snow training may be more towards keeping the athletes sharp and testing equipment for use in competition. For less qualified athletes on the other hand, a more long-term perspective should be kept in mind and athletes should train more during the competition period.

Problem Training

Similar to the preparation period, the interviewed coaches described using technique drill, technique adaptation, and competition preparation training during the competition period (See p. 118), with the majority of time being spent in technique adaptation and competition preparation training. However, there were two cases where a form of technique drill training was used during the competition period. In the first situation, the interviewed coaches described addressing very specific, individual goals in training if a readily correctable problem was discovered over the course of the season. This type of training was referred to as "problem training." In such instances, the athletes take a step back. Training is implemented that is directed specifically at solving a technical problem before the next competition. To illustrate, one of the head coaches gave the following example of problem training with a World Cup slalom skier:

"We found out that ___ went out six races in an entire year in the same kind of situation. This

was entry into the hairpin. So, you take a step back and you say, 'OK. This is all that we are going to train.' And what I did is I put together a course where there would be nothing else but flushes in an entire course. That is a very specific goal that you are trying to do."

Re-visiting Technical Goals

Some of the coaches also described cycling back to technique drill-like training to re-visit technical goals that have been worked on previously. Such a cycle, for example, might occur over the course of a training camp where the first day is spent in technique drill. Training then progresses through technique adaptation and competition preparation training before returning to competition. In addition to cleaning up any small mistakes, such a period of training allows the athletes to take a breather, shift focus a little bit, and work on things that have helped them in the past.

Using Lower Level Races for Training and Equipment Testing

A common method of training used during the competition period is to participate in lower level races:

"Let's say that you are a Europa Cup skier but you go to a FIS race, and then you use that FIS race for both confidence and for experimentation. And maybe you spend two hours training during the morning and between runs, which there is plenty of time to do that. And you are not focused just on performance in that event, but you are focused on training and using that event as a punctuation point for your training."

One of the American World Cup coaches described how he felt his athletes tend to respond better by using lower level races – Continental Cups and FIS races – for training as opposed to going away for a week and training on their own. He felt that the Americans spend so much

time on their own during the preparation period that they needed more time skiing against athletes from other nations to maintain a high enough level of intensity in their skiing.

The Importance of a High Quality and Effectiveness of Training

The physical and psychological demands on the athlete are extreme during the competition period. Therefore, training with poor quality is not seen as a productive use of the athlete's already limited time and energy. In this connection, one of the head coaches meant that any training camps over the course of the competition period – such as in preparation for a major championship – must be well planned, organized, and staffed such that the highest possible quality in training could be produced.

Pay Attention to the Things that You Can Control by Choosing

The interviewed coaches felt it important that the coach pays special attention to the on snow training that is completed over the course of the competition period. In particular, the various aspects of training such as the type of terrain, snow conditions, and course lengths should be monitored to ensure that training is preparing the athletes for the demands that they will face in competition. This information is then evaluated in light of the performance of the athletes in competition. Future training is then correspondingly modified.

An interesting example regarding the lengths of training courses can serve to illustrate this point. When asked if he planned training with mostly full-length courses during the competition period, one of the ski coaches replied:

> *"No, not necessarily. It is our feeling that that probably takes too much out of them. I mean, if you are skiing full-length slalom courses, that is very, very intensive work. I think that you do*

shorter courses ... let's say thirty gates which is half a course ... a short number of runs. You do as high quality and intensity as you can do."

The purpose of such training might be to keep the athletes sharp, yet well rested and ready for competition. At the same time, however, one of the other coaches felt that it is important to make sure that the athletes are skiing longer runs, whether in races or in training, to maintain their sport specific endurance. As he pointed out, if a skier is not finishing their races, a substantial amount of time can pass in which the athlete has not skied a long run:

"... you have to be aware of what type of skiing you are doing. What lengths of courses you use. Let's say you are a giant slalom skier and for two races in a row, you go out the first run after ten seconds. So, of your two race situations - that means in three week's time - you have not had a long run. Then you are hurting because the half-life of those [anaerobic] enzymes is so short. I mean, they are gone. So, be able, during the race season, to train long courses for those types of enzymes. Especially if they are slalom and giant slalom skiers. I mean, that is so important."

Thus, an important job of a coach during the competition period is to pay careful attention to the conditions that athletes are meeting in both competition and training and ensure that the training that they complete is keeping them both physically and technically prepared. In the above example, coaches should keep track of the lengths of courses that athletes are skiing in competition and training. If long courses are not being completed frequently enough to maintain specific endurance, then it is important to have full-length courses in training.

12.3 Determining the Structure of On Snow Training

The second decision category defined for the planning of on snow training in the competition period is the structure of the on snow training. This category involves determining such aspects of the annual plan as when to have on snow training over the course of the competition period. A number of decision variables are considered by coaches in determining the structure of on snow training (Table 12.1) including competition selection, the timing of sporting form, special preparation for up-coming competitions, and flexibility in planning.

Competition Selection

The selection of competitions in which to participate is an important variable in determining the structure of on snow training. For athletes at the highest competitive level, the competition period is primarily built around the World Cup calendar:

> *"The World Cup is like a train. It is going to go with or without you. So, you have to plan yourself to get on that schedule and follow it with your training system and following it the way that it is designed."*

Accordingly, on snow training is structured so that the athlete is as prepared as possible for each World Cup event. This often leads to a pattern of going from race to race with small amounts of rest and preparatory training in between. This is similar to what the literature describes as a cyclic organization (Bompa, 1999; Freeman, 1989).

While such a structure may be necessary for athletes competing to win the overall World Cup titles - particularly for four event skiers - the interviewed

Table 12.1. The decision variables associated with determining the Structure of On Snow Training in the Competition Period.

Decision Variables
• Competition Selection ⇨ Determine the Appropriate Focus Level ⇨ Limit the Number of Focus Level Races ⇨ Maintain Your Priorities
• The Timing of Sporting Form
• Special Preparation for Up-Coming Competitions
• Flexibility in Planning: Take Advantage of Training Opportunity

coaches felt that this was not appropriate for athletes who are competing at lower levels. Rather, for athletes of somewhat lower qualification it is also important to find blocks of time to take advantage of the good training opportunity during the winter. Thus, a more blocked approach is thought to be more appropriate for these athletes. In this connection, the interviewed coaches made three important recommendations.

Determine the Appropriate Focus Level

Perhaps an easy trap to fall into for young athletes who are just beginning to experience some success at a high level is to treat what should be their experiential level of competition as their focus level. This is a violation of the Winning at All Levels philosophy discussed earlier (See p. 234). If they start treating the World Cup as their focus level too early, then relatively little time will be left for training periods due to the intensity of the race calendar. However, if they maintain their focus on a more appropriate level, then it is much easier to identify blocks of time for training, as this ski coach expressed in the following quote:

> *"We have to be more realistic about whether the World Cup is a focus series for an athlete or whether it is an experiential series. And if it is an experiential series, then all of a sudden that opens all kinds of other possibilities. Because then you can look more at the Europa Cup schedule which is better blocked. Have training camps, FIS races to try to peak, Europa Cups, and, if things have gone well, slide into a couple of World Cups."*

Limit the Number of Focus Level Races

A similar problem to which some of the interviewed coaches referred arises when athletes treat all of their races as

focus level events. In this situation, every race is prepared for as if it were a competitive peak by including extra rest in the days leading up to the competition, as well as rest on the day of the competition. If the number of competitions being treated this way is sufficiently high, then the time available for training during the competition period will be substantially reduced.

> *"I don't think the fact that you start in the starting gate and get a time in itself is bad, but when you start counting the number of starts and people who are doing 60 days [races] in the way that I described that you would do a World Cup and spend the majority of the day sitting on your butt, then it is a severe problem."*

The solution is to limit the number of focus level races and to treat training and experiential level races as an integral part of training. This is in agreement with the literature (Bompa, 1999; Gjerset & Vilberg, 1995).

Maintain Your Priorities

Another related problem is what is sometimes referred to among coaches as "race chasing." The ranking system in alpine ski racing is fundamentally different from many of the sports described in the training theory literature. One of the underlying assumptions behind the use of periodization is that only a small number of competitions (in some cases only one) determine the athlete's world ranking (Bompa, 1999; Dick, 1997; Matveyev, 1977/1981). In such a situation, all other competitions are secondary in importance and thus the entire year builds up to these few primary events. Conversely, in alpine ski racing, each and every FIS-sanctioned race could provide the opportunity for an athlete to improve his world ranking, depending on the other participants.

Race chasing results when one's initial performance goals of the season are not met. In such a situation, it is very easy to panic and to wind up scrambling around the countryside looking for races in hopes of having a breakthrough at some point (because each race could provide that breakthrough). This leaves very little time for either recovery or training. The interviewed coaches warned against falling into this trap; Once a downward spiral in performance is started, it is very seldom that things will just turn around when racing around to different competitions. The solution, according to the interviewed coaches, is to maintain training and recovery periods in the plan. Any changes in these periods should be very carefully considered.

The Timing of the Sporting Form

A second decision variable considered in determining the structure of on snow training during the competition period is the timing of sporting form. Here, the interviewed coaches described creating cycles in the competition period, including blocks of recovery, training, and competition, to coincide with the main competitions of the season:

> *"If we, in the preparation period do make some nice cycles, then we get in the competition period and try to do this [hand indicates a flat line] instead of continuing to cycle. For an athlete that is established on the World Cup, those cycles can be matched to when their more important competitions are coming up and so forth. And for people that are not established at that level, their cycles could match how they cycle through the competition levels ... getting exposure to the World Cup and coming back to training and so on. But, it absolutely has to. It is like we put things too much into maintenance mode."*

Special Preparation for Up-Coming Competitions

Gaining experience on a race hill prior to a competition can provide a great advantage. Holding a short training camp at a future competition site allows the athletes to become familiar with the race hill, the hotel, and the surroundings. Moreover, this gives the coaches the opportunity to find their way around the new area and locate the various facilities, such as training sites. This type of preparation will help the team be more at ease during the forthcoming competitions. One of the head coaches described how he would not only try to do this for major championships, but also for new competition sites on the World Cup:

> *"Bertchesgarden is totally new on the [World Cup] schedule. You know that you have to be specifically ready for that. You need to do a specific preparation ... You maybe try before to get two to three days of training in Bertchesgarden with the team on the race hill. So, you try to make them familiar so that they don't go in there and see it as a shock. Especially for the older athletes. So that they know the hill. You want to have the athlete being able to have a picture in their head before they go there."*

The FIS does have regulations regarding training on race hills prior to the event that need to be considered in this instance. Specifically, training is not allowed on race hills five days prior to the beginning of official training or competition for World Cups[16] and two days prior to the beginning of official training or competition for Europa Cups.[17] This means that training on a new race hill will have to occur at some point during the competition period other than immediately prior to the event.

[16]Article 14.2 of the Rules for the Alpine FIS World Cup, 1998/1999.
[17]Article EC.6.1 of the Rules for the Alpine Continental Cups, 1998/1999.

I have seen in my own experience where coaches plan training camps – or select competitions – at future championship locations in the years prior to the event so as to gain experience on the hill.

Flexibility in Planning: Take Advantage of Training Opportunity Whenever You Get the Chance

Finally, the interviewed coaches pointed out that one needs to be prepared to be somewhat flexible in implementing training plans due to the uncertainty of weather and snow conditions. In particular, one should be prepared to take advantage of good training conditions when the opportunity presents itself:

> *"I think that in skiing whenever you have the chance to get better, and it is good skiing, you do it. Always be ready for it. That is what it comes down to."*

During the competition period however, it is difficult to balance the immediate performance needs of an athlete (for example, rest) versus their long-term development (for example, getting in some good training while you have the chance). The degree to which one should be flexible in this manner probably depends somewhat on the level of the athlete. For athletes competing at the very highest level, training may be of lesser importance than rest. However, for developing athletes, perhaps training should be a priority in the interest of the athlete's long-term development.

12.4 Summary

In summary, two decision categories were described for the planning of on snow training in the competition period:

the contents of on snow training and the structure of on snow training.

A number of the characteristics of the contents of on snow training during the competitive period were identified in the interviews. The interviewed coaches were particularly concerned that training in the competition period should be of a high quality. All phases of training were included at various points of the competition period. In particular, technique adaptation and competition preparation training were planned for. However, even technique drill training – in the form of problem training and re-visiting technical goals - was implemented at times. The interviewed coaches also described using lower level races for training. Finally, it is important that coaches keep track of the various aspects of training that they can control (such as course dimensions, terrain types, and snow conditions) so they can ensure their athletes are both physically and technically prepared for the situations they will meet in competition.

Regarding the structure of on snow training, four decision variables were defined on the basis of the interviews. First, competition selection is an important variable to consider as the distribution and number of competitions determines the time available for training. In this regard, the coaches felt that one should be especially careful in determining the focus level of competition. Moreover, one should limit the number of focus level competitions, particularly for younger athletes who could benefit from in-season training periods.

Some of the interviewed coaches also felt training is set on too much of a maintenance mode during the competition period. Instead, cycles should be built into the competition period where an athlete would cycle between

recovery, training, and competition and between the different levels of competition.

A couple of the interviewed coaches also felt it important to train at upcoming competition sites to become familiar with the race hill and surroundings prior to the competition. This was particularly important in the preparation for major championships and new competition sites.

Finally, the coaches emphasized that one should remain somewhat flexible. Due to changes in weather and snow conditions, unexpected opportunities to train may arise and it is important to take advantage of these.

CHAPTER 13. THE PLANNING OF DRYLAND TRAINING IN THE COMPETITION PERIOD

13.1 Introduction

The third decision category class for the competition period is the planning of dryland training. In my experience working at USSA, I found that while the planning of conditioning training during the preparation period was quite structured and detailed, such was not the case for the competition period. Instead, it seemed that dryland training in the competition period was planned only in a very general sense. This observation was confirmed in the interviews with the conditioning coaches who preferred to adapt dryland training to meet the needs of the athletes on a day-to-day basis. This artistic side to the planning and implementation of training is an important aspect of this chapter.

Two decision categories were identified from the data analysis for this class, each of which are presented in the following sections of this chapter. In the first section, a description of some of the different goals and methods of dryland training during the competitive period are presented. In the second section, the identified decision variables associated with determining the structure of dryland training in the competition period are discussed.

13.2 A Description of the Contents of Dryland Training

The contents of dryland training refers to the various methods of conditioning training. In this section, a number of the goals of dryland training during the competition period as identified during the interviews are presented. These include physical preparation for the next race, maintenance of a competitive attitude, relaxation, and maintenance of physical conditioning levels.

Physical Preparation for Competition

Perhaps the main goal for conditioning training, as described by the interviewed conditioning coaches, is to help the racers get physically prepared for the next competition. In this regard, dryland training can take on either a hard training or recovery role. This aspect of conditioning training is described further under the section of Determining the Structure of Dryland Training, p. 265.

Maintenance of a Competitive Attitude

It is not uncommon for postponements and cancellations of races to occur due to poor weather, snow, or visibility. As a result of these postponements, athletes may have to wait for a period of several days before a decision is made on whether or not to hold a competition. During this time, an athlete’s level of focus and motivation can be tested. In this situation, the conditioning coaches felt that dryland training can provide an important and timely distraction to avoid the attitude-deteriorating affects of boredom and thereby keep the athletes sharp and focused.

Relaxation

Another, related goal of conditioning training is to help the athletes take their mind off the stress of competition. By doing something different and enjoyable, such as a fun game, the athletes can relax and enjoy themselves:

> *"[Dryland training in the competition period] is mostly things that take your brain for a ride, if you understand. So that you get away from skiing ..."*

Maintenance of Physical Conditioning

The third and perhaps most obvious goal of conditioning in the competition period is to maintain physical fitness levels over the course of the winter. Similar to on snow camps during the preparation period, the conditioning coaches try to follow closely the situation on the hill during the competitive season. If the on snow training and racing is not enough of a stimulus to maintain certain components of physical fitness, then they supplement training with the appropriate form and volume of conditioning training.

13.3 Determining the Structure of Dryland Training

The interviewed coaches described a number of variables that they consider when determining the structure of the dryland training in the competition period. These are presented in Table 13.1.

Be Careful Not to do Too Much

A number of the interviewed coaches felt that one should be careful not do too much during the competition period. It seems that the psychological and physical loads are so

Table 13.1. The decision variables associated with the decision category of determining the structure of dryland training in the competition period.

Decision Variables
• Be Careful Not To Do Too Much
• The Need To Be Flexible ⇨ The Timing of Sporting Form ⇨ The Instability of the Competition Calendar ⇨ The On Snow Training ⇨ The Athlete's Energy Level and Motivation ⇨ The Available Facilities
• Cycle Into Heavier Periods of Dryland Training
• Difficult to Implement Training Due to Limited Staff

high just with competitions, on snow training, and travel that it is very easy to do too much:

> *“The strain is so high, so you can really do a lot of damage if you try to over do it. I have seen more damage done than the opposite.”*

The Need to be Flexible

Perhaps one of the most challenging aspects of planning conditioning training during the competition period is that there is no solid basis on which to plan. This is primarily a result of instability in the competition calendar due to changing weather and snow conditions:

> *“... you schedule a strength day and then all of a sudden the on snow program changes. And it throws your conditioning schedule out of whack because all of a sudden what you planned on doesn’t make sense anymore. Because the race day has changed and so on. And so, you have to be flexible all the time.”*

Coaches must also adapt conditioning training according to the energy level and needs of each individual athlete. Complicating matters even further is the fact that the availability of training equipment and facilities can be quite limited depending on the location. This instability in the framework upon which conditioning planning must be based, seems to result in dryland training being planned in a very general sense over the course of the competition period. The specifics are then adapted on a day-to-day basis to meet the demands of the current situation.

Thus, the conditioning coaches – working in close cooperation with the athletes - must evaluate the current circumstances including the level of fatigue and motivation of each individual athlete, the physical and

psychological demands of the on snow training and racing, and the competition schedule. Based on this daily evaluation, they must plan and implement conditioning training that will stimulate each athlete to reach his best possible sporting form by the time of competition. In this manner, conditioning training is an integral component of the preparation for competition.

> *Int: "What kinds of factors do you look at when you are making the decision as to what kinds of conditioning to do?"*
>
> *Sub: "How does the racer feel? Like, does he feel tired? Is he motivated or not? It is different things. How much he can do of training. Your experience with the racer. But it is always with the focus on to be fit for racing. To be at the peak when you are going to race again. It is always with this goal."*

An example may serve to illustrate this point (Figure 13.1). If, as in Figure 13.1 A, the athlete is tired and the next competition is soon, then low intensity activities, such as easy riding on a bicycle ergometer or a pool workout, may be used to enhance recovery. On the other hand, if the athlete is at the top of his form (as in Figure 13.1 B) and there are several days before the next competition, a heavy dryland session such as strength training may be used to stimulate supercompensation in sporting form prior to the event.

Cycle into Heavier Periods of Dryland Training

Some of the interviewed coaches felt the conditioning training typically completed during the competition period is not enough to maintain physical conditioning levels over the course of the entire, five month long competition period. They felt that there should be some periods with heavier dryland training:

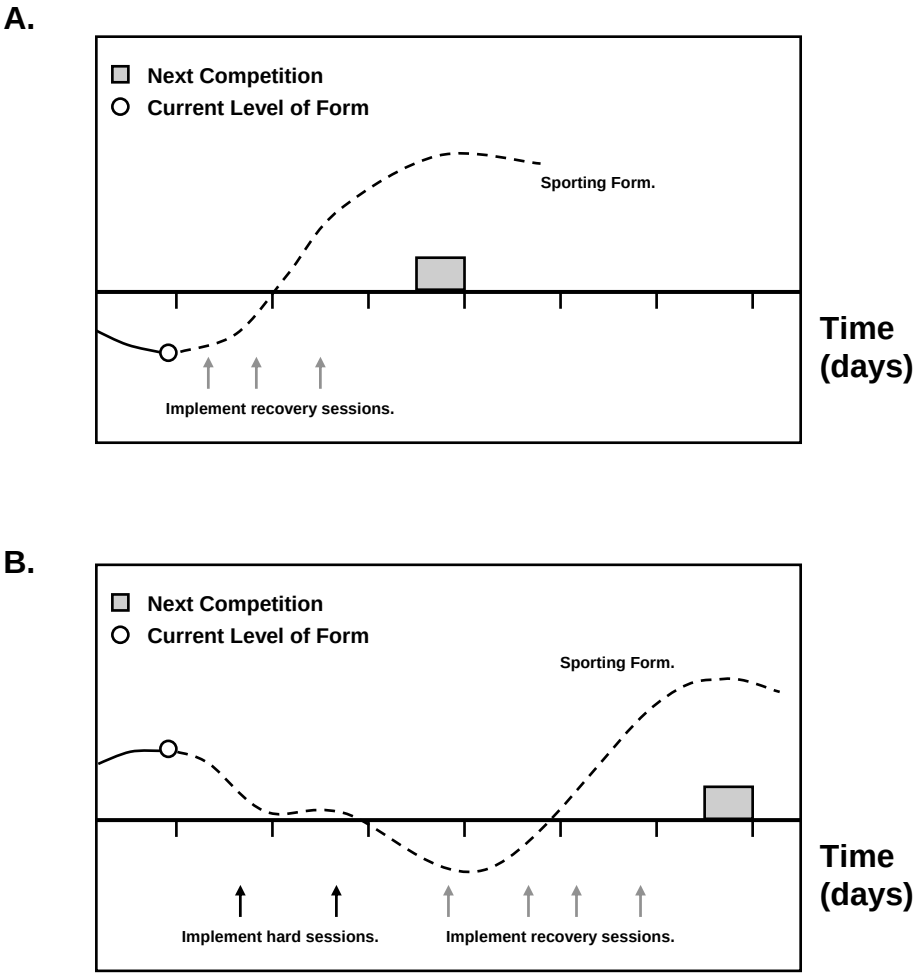

Figure 13.1. A diagram illustrating the need for conditioning coaches to consider both the length of time prior to the next competition and the current level of form of the athlete when planning conditioning in the competition period. Both diagrams A and B are modified from sketches created during the interviews.

> *"The typical routine is play a little volleyball one day, lift weights one day, go for a jog one day and do a stretch and then the next week you do the same thing. And I think that things have to get broken down more than that."*

One instance where some of the coaches felt it would be appropriate to have a heavier period of dryland was in the preparation for a major championship. The thinking was that this heavy period of training would lead to a supercompensation in sporting form following an adequate period of recovery. This block of training is often included approximately one month prior to the championship, i.e., in early to mid January:

> *"What we did, and it proved us right in a few instances I can tell you, that in our periodization, before the peak, we trained a lot about three weeks prior to that event. Let's say events are usually in the middle of February. We would do an intense one or two weeks in the middle of January for a period of about two weeks. Skiing and dryland. Especially with dryland because we knew with skiing that we cannot really do a whole lot more than follow the World Cup schedule."*

Difficult to Implement Training Due to Limited Staff

One of the difficulties conditioning coaches run into during the competition period is that coaching staffs are often limited in number. Hence, conditioning coaches must take on additional job responsibilities. For instance, they might be responsible for certain aspects of on snow training and team organization. In the worst case, conditioning coaches may not have any time to plan and implement dryland training during the competition period. This stresses the importance of educating athletes so that

they can be independent and make appropriate decisions about what they need to do in conditioning.

13.4 Summary

One of the main classes of decision categories to be considered in the annual plan is the planning of dryland training in the competition period. Two decision categories were defined for this class: the contents of dryland training and the structure of dryland training.

In regards to the contents of dryland training, a number of primary goals were identified including physical preparation for competition, maintenance of a competitive attitude, relaxation, and maintenance of physical conditioning.

In connection with the structure of dryland training, four decision variables were defined. First, the interviewed coaches felt that it is very easy to do too much. This places emphasis on the need for conditioning coaches to closely evaluate the following factors and adapt training accordingly: The situation in on snow training and racing (have they been skiing short courses or long courses, have they been missing days due to poor weather, etc.), the athlete’s level of fatigue, the length of time until the next competition, the amount and stress of travel, and the types of facilities that are available. Some of the coaches also felt dryland training should cycle into some heavier periods over the course of the competition season to help maintain physical fitness better. Finally, a number of the conditioning coaches pointed to limitations in the number of staff as a problem in implementing dryland training during the season.

CHAPTER 14. THE PLANNING OF RECOVERY IN THE COMPETITION PERIOD

14.1 Introduction

The fourth class of decision categories defined for the competition period is the planning of recovery. Although the importance of recovery during the competition period was made clear during the interviews, relatively little discussion of recovery planning took place. I therefore believe that upon further interviewing, a more thorough overview of recovery could be obtained. Nonetheless, the important issues that were uncovered during the interviews are presented here. On the basis of the interviews, only one decision category was defined for this class, the structure of recovery.

14.2 Determining the Structure of Recovery

The decision category of the structure of recovery refers to the determinations of when to plan recovery during the competition period. This thesis will focus on major periods of recovery, i.e., periods of a few days or longer. Three decision variables were identified in this category, namely the importance of cycling into recovery periodically, the timing of sporting form, and the constraint of travel (Table 14.1).

Table 14.1. Decision variables associated with the decision category of determining the structure of recovery in the competition period.

Decision Variables
• The Importance of Cycling Into Recovery Periodically
• The Timing of Sporting Form
• Contraints ⇨ Travel

The Importance of Cycling into Recovery Periodically

The competitive season is seen as an extended period – around five months in length – of extremely high physical and psychological stress. Consequently, one of the top priorities that a coach should have when planning the competition period is recovery. Here, the interviewed coaches felt it necessary to cycle into periods of recovery at various points during the competition period. In addition to allowing for physical recovery, it is thought that periodic rest periods help the athletes to maintain their motivation and concentration. Some of the coaches felt that strategically placed recovery periods allow for sporting form to be maintained at a higher level over the course of the whole season.

The Timing of Sporting Form

When determining the timing of recovery periods, it is also important to consider the competition calendar and the timing of when the athlete needs to be in top competitive form. In the following quote, one of the head coaches hints at a cyclical arrangement of the competition period where a recovery period is placed after a hard race period and before building back up towards another cycle of competitions:

> *"We have to try and figure out a way that we put in some decent rest. The schedule makes it difficult. But we have to just sacrifice sometimes. I mean, we can not go week to week to week. We have to look at where it makes sense to take a week off and take a full break so that we can come back in a little fresher and start working up again. And, so basically, it takes the cooperation of both the athlete and the coach to put the plan together. And you have to decide where it is the most important place for you to be really on."*

Three points in particular were identified as being important times to include recovery. First, a recovery period in late November or early December is important. The final month or two of preparation and the first month of competition (i.e., September, October, and November), typically involve a lot of time away from home as well as a very high load of physical and psychological stress. Thus, a common time to include a short block of recovery is the end of November after the first block of competitions. For an American Europa Cup team, this fit naturally as they had a small break in the race calendar in between the first races in November in the United States and the December races in Europe:

> *"After that long month in November, you want to have a couple of days at home to rest and then have a good strong month in December in Europe ... The rest periods are very important."*

Second, when possible, a small break is often included over Christmas. However, not all teams are able to take this break at home due to the competition calendar and the distance to travel home.

Last, a couple of the interviewed coaches explained that they prioritize recovery more and more toward the end of the season. They felt that over the course of the season an accumulated fatigue begins to develop. Consequently, they meant that to maintain performance levels in competition towards the end of the season, it is necessary to include more recovery.

Constraints: Travel

One of the primary constraints that coaches must consider when planning the competition period is travel. For highly qualified athletes in alpine ski racing, the competition calendar requires substantial travel during

the winter. This travel reduces the time available for recovery and training. One of the head coaches pointed out that one must seek to minimize the amount and stress of travel in planning. Oftentimes this can be a question of financial resources.

14.3 Summary

In summary, the interviewed coaches unanimously agreed that recovery is one of the most important aspects to consider in planning the competition period. One decision category was defined on the basis of the interviews for this class, the structure of recovery.

Three decision variables were identified for determining the structure of recovery. One philosophy some of the interviewed coaches brought up was the importance of planning periodic rest periods throughout the competition period. Rest helps maintain a higher level of sporting form over the entire season. A second factor that coaches should consider is the timing of sporting form. Rest periods are often strategically placed after hard blocks of racing and training and prior to a new period of building up. Finally, the amount of travel limits the time available for recovery. Therefore, the interviewed coaches felt it critical to plan travel carefully so as to minimize this problem.

CHAPTER 15. THE TIMING OF SPORTING FORM

15.1 Introduction

The final class of decision categories defined on the basis of the interviews is termed the timing of sporting form. This class refers to the coach's decisions regarding the "timing" of the annual plan, i.e., how the training progressively stimulates the development of the athlete's sporting form with the ultimate aim of obtaining and maintaining maximum form over a specific period of time.

The actual term "timing of sporting form" was selected for a specific reason. In the English language literature, the common term used to describe this concept is "peaking." According to Bompa (1994) peaking is a process by which an athlete achieves "a temporary state of training when physical and psychological efficiencies are maximized and where levels of technical and tactical preparation are optimal" (p. 94). Peaking results in the athlete's best performance of the year or macrocycle.

On the basis of my experience and the interviews, I feel that the term peaking has earned a negative reputation in alpine ski racing due to its common association with the strategy of centering an entire year of training around performance in a single, main event (Figure 15.1). The reasons for this will be explained shortly. Nevertheless, all training programs do have a certain timing to them in

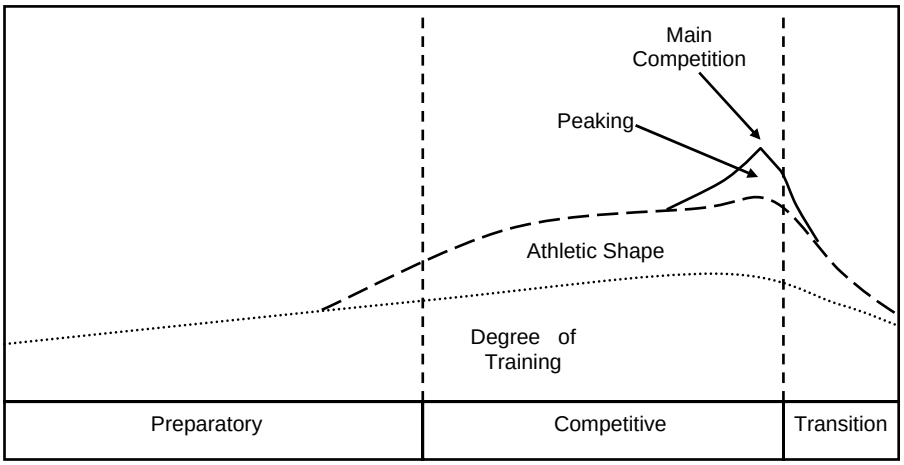

Figure 15.1. The peaking of sporting form for a single major championship in the annual plan. Modified from Bompa (1994).

that the athlete is preparing to compete over a predetermined period of time. To avoid the negative connotations associated with the term peaking, I have elected to refer to this aspect of the annual plan as the timing of sporting form. In the following section of this chapter, some of the philosophies that coaches consider in determining the timing of sporting form for an annual plan are presented.

15.2 Determining the Timing of Sporting Form

This decision category refers to determining the timing of the annual plan. Four philosophies of the interviewed coaches in this regard were identified during the analysis (Table 15.1).

The Timing of Sporting Form Should be Aimed at Blocks of Time

First, the interviewed coaches emphasized that the timing of the annual plan should be directed at periods of time – such as weeks or months - instead of single competitions, as is normally associated with peaking. A number of reasons were identified for why centering the annual plan on only one or two competitions would be both difficult to accomplish as well as undesirable in the sport of alpine ski racing.

Selection is Contingent on Prior Performance

For one, selection criteria for major championships – such as the Olympics or World Championships – are often designed to reward consistent, good performance over a given series of competitions prior to the championship. While quota spots may be somewhat secure for athletes at the very highest levels, the majority of athletes will be challenged to meet qualification criteria over the course of the season. This can create difficulties in peaking

Table 15.1. Decision variables associated with the decision category of determining the timing of sporting form.

Decision Variables
• The Timing of Sporting Form Should Be Aimed at Periods of Time ⇨ Selection is Contingent on Prior Performance ⇨ It Is Important to do Well in All World Cups ⇨ The Risks of Peaking Are Not Worth It ⇨ Instability of the Race Calendar
• The Athlete’s Qualification
• The Importance of a Good Early Season Start ⇨ Motivation ⇨ The FIS World Ranking Lists
• Synergy

for the major championship, as one of the coaches explained:

> *"It is much easier to plan if you are guaranteed that spot. Then you can try to peak for [the Olympics]. But more often than not, people will have to qualify. So, every race leading up to that counts. They have to peak for that race. And then peak for the next one and the next one so that they can just show up. To be on the start list. And then hopefully they will be able to perform. And, so, it is a legitimate thing when an athlete says, 'How can I peak there when I don't even know if I am going?' So, every race is important. It is hard to say which one is more important than another."*

Based on this, it is important that the national federation establishes qualification criteria that are conducive to both athlete preparation and competitive performance.

It Is Important To Do Well in All World Cups

A second reason why peaking is frowned upon is that for many athletes it is important to do well in all World Cup events over the course of the season, as in the case of an athlete aiming at winning an overall World Cup title. This may mean participating in upwards of 50 competitions, all of which are important. Thus, sacrificing performance in some races in order to peak for one race in particular may be in conflict with the athlete's goals.

The Risks of Peaking Are Not Worth It

Third, no matter how good the form of an athlete, he may be out of a race in mere fractions of a second. Moreover, the reason for not finishing may not be under the athlete's direct control. For instance, there have been cases in major championships where athletes have ejected

out of their bindings before they even have left the start. Thus, at least one of the interviewed ski coaches felt it too risky to plan an entire year of training around preparing for just a single competition. To put it simply, you should not put all of your eggs in one basket.

Instability of the Race Calendar

Finally, the race calendar is subject to cancellations and postponements due to the unstable weather and snow conditions typical of the winter season. As one coach pointed out, the unstableness of the race schedule makes it very difficult to stick to any sort of plan aimed at peaking for a certain competition:

> *"Our playing field is never flat. So, it is really hard to peak at a certain time. We are always dealing with weather, schedule changes, venue changes ... So we can't stick to a schedule, a plan. It just doesn't work out that way."*

The Athlete's Qualification

While the timing of sporting form should be aimed at periods of time, the actual duration over which sporting form is maintained at a high level probably depends on the level of the athlete. Although athletes competing to win overall World Cup titles seem to maintain sporting form for the entire duration of the five-month competitive season, the interviewed coaches did not feel that such a strategy was appropriate for lower level athletes. In fact, for the majority of athletes it is preferred to identify shorter blocks of the competition period on which to focus.

This fits well with the importance of on snow training during the competition period for developing racers (see p. 246). By prioritizing certain periods of the

competition period, time can be set aside for training – both conditioning and technique – as well as for recovery. This places emphasis on determining the appropriate focus level for the athlete, limiting the number of focus level competitions, treating training and experiential competitions as a part of training, and maintaining priorities in the face of unexpected problems.

The Importance of a Good Early Season Start

The third philosophy regarding the timing of sporting form is the importance of a good early season start. Some of the interviewed coaches expressed that it is important for athletes to perform well in the first portion of the competition period. A couple of reasons were given for this.

Motivation

For one, the interviewed coaches feel that having a good start to the competition period provides an important foundation for the rest of the season. It seems to give the racers a confidence in their preparation and motivation for further performance:

> *"We could see for ___ when he made his World Cup victory, combined, he was starting the season really good. And I think that is the best feeling for a racer if he can start the season really good. I think that it is much easier to go on from this level."*

The FIS World Ranking Lists

Another important reason for prioritizing performance in the early competition period has to do with how the FIS calculates world rankings. The better one's world ranking, the better chance one has of obtaining a good start position in races. However, the FIS does not update

the world rankings continually[18]. Instead, updates are made at certain points over the course of the competition period: The start of the competition period; approximately the first of the New Year; the end of January; and the beginning of March. Thus, performing well in the first part of the competition period, prior to Christmas, is advantageous in that the athlete can compete with improved seeding in races over the main bulk of the season:

> *"We think that it is very important for us to come out of the blocks hard and doing well in December, if we can. Because that points list is very important for us. It really carries us through the rest of the season. So, we really are going to try to come out in December very competitively."*

Conversely, if the athlete does not perform in the first part of the competition period and fails to improve their world ranking on the second update, they will have to wait until the third list comes out at the end of January to improve their seeding. At that point, a substantial portion of the competition period is already past.

Synergy

The final philosophy of coaches regarding the timing of sporting form is what I believe to be an application of the concept of synergy as introduced by Gambetta (1989). In the previous chapters of this thesis, each of the classes, decision categories, and sub decision categories has been presented relatively independently. But what is more important than looking at any one category alone is how each of them relate to the others to create a "whole plan" which moves in one direction – to ski faster over a

[18] This may not apply to the World Cup as seeding for these races is determined slightly differently.

predetermined period of time. This point was emphasized by one of the coaches in connection with dryland training:

> *"... what we need to hit is, 'How does physical training make us better skiers?' Because a lot of times, I think a lot of us tend to rely on this [physical conditioning] to make us better. We rely on the physical training as the only component. If it is a whole motion ... the whole direction is capsuled into the ski training ... I think that we can get somewhere."*

The important point here is that each of the components of the annual plan needs to be directed at the same, ultimate goal of attaining the predetermined timing of sporting form. This has consequences for how on snow training, dryland training, recovery, competition selection and equipment testing should be structured in the annual plan. How these components synergistically develop over time to stimulate the attainment of a high degree of sporting form at predetermined periods of time is of the utmost importance. I tried to emphasize this aspect of designing the annual plan in Appendix D by interconnecting all the classes and categories with each other and with the Timing of Sporting Form.

15.3 Summary

One of the important decisions a coach must make in designing the annual plan is the timing of sporting form. On the basis of the interviews, four decision variables were defined for this category.

First, the interviewed coaches emphasized the importance of planning the timing of sporting form for periods of time instead of for a single competition. There are several reasons for this including the fact that many athletes must meet challenging qualification criteria; the

fact that high level athletes often have goals of performing well in all World Cups; the inherent risks in “putting all of one’s eggs in a single basket”; and the instability of the race calendar.

Second, it appears that athletes of the highest qualification try to maintain a high level of sporting form for the entire duration of the competition period. For instance, this seems to be the case for athletes competing to win overall World Cup titles. However, for athletes below this level, the interviewed coaches felt that the competition period should be broken up into shorter blocks of competition to allow for recovery and training.

The third variable described by the coaches in determining the timing of sporting form is the importance of a good start to the competitive season. It seems that good results in the first portion of the season provide an important psychological boost coming into the main portion of the competition period. Additionally, good performances in the early season result in better seeding for later races.

Finally, how all the components of the annual plan work together to develop the athlete’s sporting form is an important aspect to consider in planning.

PART 4. SUMMARY AND CONCLUSIONS

CHAPTER 16. SUMMARY AND CONCLUSIONS

16.1 Introduction

The purpose of this study was to explore and describe the philosophies of expert coaches in regards to designing the annual plan for highly qualified alpine ski racers. In so doing, I hoped that progress could be made in bringing theory and practice together under the Integrated Model of planning training (Balyi, 1992) in alpine ski racing (Figure 1.1). Based on these goals, the problem statement for this thesis consisted of the following three questions:

> *According to the experience of expert coaches, what are the important aspects on which to focus in the design of the annual plan for highly qualified alpine ski racers?*
>
> *When making decisions regarding these aspects, what factors and philosophies do expert coaches consider?*
>
> *How do the philosophies of these expert coaches compare with the literature?*

To answer these questions, in-depth, unstructured interviews with fourteen expert coaches from six different countries were completed. Following the methods of grounded theory, a five-tiered categorization system was inductively developed based on the interviews. The five levels consisted of (1) classes of decision categories,

(2) decision categories, (3) sub decision categories, (4) decision variables, and (5) dimensions of decision variables. Some of the primary findings of this study are summarized in the following sections of this chapter. This is followed by some recommendations for future research.

16.2 Question 1: What Are the Important Aspects on which to Focus in the Design of the Annual Plan?

The first three tiers of the categorization scheme (i.e., the classes, decision categories, and sub decision categories) represent the important aspects that need to be considered in preparing the annual plan as identified on the basis of the interviews. The system of decision classes, categories, and sub-categories is presented in Appendix D. In general terms, important aspects of the annual plan to consider include on snow training, dryland training, recovery, equipment testing, competition, and the timing of sporting form.

16.2 Question 2: When making decisions regarding these aspects, what factors and philosophies do expert coaches consider?

In answering the question of which factors and philosophies coaches consider in planning, decision variables and dimensions of decision variables were defined for each category and sub-category. Over the course of the interview analysis, it became clear that certain variables were of particular importance in creating the annual plan.

One of the decision variables described by the coaches as influencing almost every aspect of the annual plan is the importance of a high quality and effectiveness of on snow

training. In fact, it seems that all aspects of the annual plan were organized so as to facilitate productive on snow training.

Variety in training was another variable that arose often in the analysis of the interviews. In terms of technique, a large amount of variety was important to stimulate the athlete's ability to adapt his technique to the large diversity of situations he will meet in competition. Variety was also important to motivate the athletes to give their full effort in training.

The interviewed coaches identified a number of constraints that must be considered in planning. Two of the primary constraints were budget and travel. Tradition within the ski federation also had the potential to act as a constraint in planning. Due to the high risk involved, coaches (or ski federations) were sometimes afraid to break with tradition and try new ideas. Perhaps one of the most challenging constraints to deal with was that of the unstable foundation upon which planning must take place due to changing weather and snow conditions. This was more the case for the competition period than the preparation period.

Another decision variable that repeatedly arose during the interviews was what Gambetta (1989) has referred to as synergy. This concept was important in two ways. First, the interviewed coaches stressed the importance of considering the whole athlete – all of his physical, psychological, and social needs - when planning training. Second, the coaches emphasized the importance of having all the different components of the annual plan directed at the same ultimate goal of skiing faster at a predetermined time period. I tried to emphasize this point in Appendix D by connecting the different classes and categories together under the timing of sporting form.

16.4 Question 3: How do the philosophies of expert coaches compare with the literature?

Over the course of the interview analysis and review of the literature, a number of similarities and differences between the literature and philosophies of the coaches became apparent. It appears that the Classical Periodization Model has had a significant impact on the planning of training in alpine ski racing, at least as far as the preparation period is concerned. The principles of load progression, moderation, continuous load demand, variety, multi-lateral development, and specificity were all applied in the planning of the preparation period.

During the competition period, things became much more complex however due to the instability of the weather, snow conditions, and competition calendar. Thus, while training plans during the preparation period appeared fairly structured and systematic, it seemed that a more flexible planning model was needed during the competition period. This difference in planning between the preparation and the competition periods was the reason for their separation in the diagram in Appendix D.

The interviewed coaches described certain tasks they used to deal with this uncertainty. These included defining the long-term picture; keeping plans simple and safe; creating back-up plans; establishing clear philosophies; keeping track of what has been done; and maintaining priorities in the face of changes. In addition, it was important to define the appropriate focus level for the athlete, limit the number of focus level competitions, and treat training and experiential competitions as a part of preparation. This instability also placed great importance on the experience of the coach.

Another important difference from the Classical Periodization Model was the lack of a major transition period following the competition period. To maximize carry-over from the competition period as well as to take advantage of the good snow conditions at that time of the year, a period of on snow training was often planned early in the new season. Major recovery periods were instead planned later in the Summer when snow conditions were at their worst. This reduction in the length of the transition period is similar to the observations of authors who have studied other sports (Lange, 1999; Maglischo, 1993; McInnis, 1981; Spassov, 1988; Viru, 1995).

Some tendencies towards the Exercise Physiology Model were also identified in the interviews. Due to the necessity of concentrating on snow training into blocks of time, it seemed that the Exercise Physiology Model fit well with the sport of alpine ski racing. Indeed, the interviewed coaches described conditioning and technique training as being separated more and more into distinct blocks to avoid interference. In addition, some of the coaches described structuring dryland training into periods of concentrated, unidirectional training.

In a couple of examples, dryland training, recovery, and technique training were structured to take advantage of the long-term lag in the training effect. However, I believe that the coaches saw this as meaning that athletes should be in good enough shape and sufficiently recovered from conditioning prior to on snow training. While this is certainly an important aspect, I believe that Verkhoshansky takes things a step further. He believes that technique is different when an athlete is in a high state of specific physical fitness from when he is in poor condition. Thus, for Verkhoshansky it is important that technique training takes place when the athlete is in a

high degree of specific fitness. The consequence of this is that a period of specific physical preparation – in particular strength training - should proceed technique training.

In terms of technique, a three phase model of training was identified on the basis of the interviews. The primary difference between this model and those proposed in the literature was the importance of variety in early stages of training. The interviewed coaches seemed to agree with the sport specific literature regarding the importance of adaptability in skiing technique and the consequences this has for training (Major & Svendsen, 1995; Müller, 1981; Müller, 1984).

Another difference from theory was the importance of equipment testing in the preparation of the athlete. To my knowledge, how equipment preparation should be organized as a part of the annual plan for an athlete has not been addressed in the literature. Yet, according to the interviewed coaches it is one of the most important aspects of preparation in alpine ski racing.

16.5 Directions for Future Research

This study has primarily focused on identifying the main aspects to consider in designing the annual plan and their interrelationships. I believe that future work should be directed more towards exploring each of the identified decision classes, categories and sub categories in greater depth. Through using a variety of methods such as in depth interviews with coaches, staff, athletes, and equipment technicians; observation of planning meetings and training sessions; and quantitative tracking of training and competition results, important information could be obtained to further develop the model proposed in this thesis. I also believe that similar studies directed

at different levels of development could provide very useful information for clubs and development programs.

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APPENDIX A
RESEARCH QUESTIONS

PROBLEM STATEMENT:

According to the experience of expert coaches, what are the important aspects on which to focus in the design of the annual plan for highly qualified alpine ski racers?

When making decisions regarding these aspects, what factors and philosophies do expert coaches consider?

How do the philosophies of these expert coaches compare with the literature?

OPERATIONALIZATION OF TERMS:

- **ANNUAL PLAN**

  This study will primarily focus on the philosophies of expert coaches regarding the planning of an entire year of training, both preparation and competition periods, for a highly qualified alpine ski racer. For this thesis, the term “annual plan” is defined as the blueprint which specifies the team’s – or individual’s – training and competition strategy in general terms for the duration of one competition year. Areas of special interest in this connection will be limited to physical training, technical and coordination training, tactical training, competition selection, and equipment testing.

- **ELITE ALPINE SKI RACER**

  Is a racer who:
  - is a national team member (either World Cup or Europa Cup team).
  - is male or female.
  - is in the 3rd or Late phase of development (Bloom, 1985).

- **EXPERT COACHES**

  Are coaches who:
  - have at least 10 years of experience coaching full-time in alpine ski racing.
  - are currently working at the national team level.

RESEARCH QUESTIONS:

A primary goal of this research is to stay focused on the important aspects of programming and organizing of the *whole, integrated* training program for an athlete. However, it is necessary to divide up the whole to allow for a comprehensible discussion. The research questions are therefore divided up

into three major categories, Preparation Period Training, Competition Period Training, and General Issues.

1. The Preparation Period

a. On Snow Training. What are the important aspects to consider in the planning of on snow training during the preparation period? What are the philosophies of expert coaches regarding these aspects? How do these philosophies compare with the available literature?

(1) What types of on snow training are completed?

(2) How is on snow training structured throughout the preparation period?

(3) What factors are considered when planning training camps?

(a) What factors are involved in deciding the location?

(b) What factors are involved in deciding the length of the camp?

(c) How many days rest / skiing?

(d) What factors in planning the annual plan should a coach be concerned about for ensuring quality training?

(e) What types of conditioning are planned for camps? How much?

(4) What factors are considered when planning equipment testing?

(a) How important is equipment testing?

(b) How is equipment testing incorporated into the athlete’s technical development?

b. Dryland Training. What are the important aspects to consider in the planning of dryland training during the preparation period? What are the philosophies of expert coaches regarding these aspects? How do these philosophies compare with the available literature?

(1) How is dryland training structured throughout the preparation period?

(a) How long are dryland training periods?

(b) What factors are considered in planning dryland training camps?

(i) When are dryland training camps planned for?

(ii) What kinds of training are completed at dryland training camps?

(2) What factors are considered when planning recovery? How is recovery structured throughout the preparation period?

2. The Competition Period

a. Competitions. How are races accounted for and organized as a part of the overall plan?

(1) What factors are considered in the selection of competitions?

(2) Are certain competitions peaked for?

b. On Snow Training. What are the important factors to consider in the planning of ski training throughout the competition period?

(1) How much emphasis is given to training during the competition period?

(2) How is training structured throughout the competition period? Is there a systematic effort towards peaking for certain times of the year?

c. Dryland Training. What are the important aspects to consider in the planning of dryland training during the competition period?

(1) What kinds of dryland training are completed during the competition period?

(2) How is this training structured throughout the competition period?

3. General Issues in the Planning of Training.

a. How are the various aspects of preparation (physical trianing, technical and coordination training, tactical training, competition selection, and equipment testing) organized together?

b. How is adaptability in training plans handled?

(1) What kinds of difficulties are faced with the implementation of the training that is planned?

(2) How are training programs adapted to take advantage of unforeseen opportunity?

APPENDIX B
INTERVIEW GUIDE

1. Introduction ☐
   - Importance of their opinions
   - Purpose & interview organization

2. Coach's background ☐

3. How is planning carried out? ☐

4. Long-Term Planning of Training ☐

5. Preparation Period Training

   - Ski Training
     a. Periodization / Distribution ☐
     b. Use of Timing ☐
     c. Cross Nation Training ☐
     d. Equipment Testing ☐
     e. Camp Factors ☐
     f. Altitude ☐
     g. Conditioning at Camps ☐
     h. Team Selections ☐

   - Conditioning
     a. Strength ☐
     b. Anaerobic Endurance ☐
     c. Aerobic Endurance ☐
     d. Coordination/technique ☐
     e. Recovery ☐

6. Competition Period Training

   - Ski Training
     a. Periodization ☐
     b. Team Selections ☐

   - Conditioning
     a. Periodization ☐

   - Difficulties faced ☐

   - Peaking / Competitions ☐
     a. # of Starts ☐
     b. Short Term Prep ☐
     c. After Major Competitions ☐

7. General Issues

   - How to plan all as a whole ☐
   - Felxibility in plans ☐
   - Traditional planning within the team ☐
   - Why is planning important? ☐

8. Conclusion ☐
   - Review purposes
   - Summarize interview
   - Appreciation

Session Information:

Date : **Tape ID :**

Location : **Length :**

Subject :

Subject ID :

Contact Information:

Address:

tel :
fax :
email :

APPENDIX C
INFORMED CONSENT FORM

INFORMED CONSENT

Project Title:
"Some aspects of the planning and organization of training for elite alpine ski racers."

Student:
Robert C. Reid
The Norwegian University of Sport and Physical Education

Purpose:
This research is being completed in partial fulfillment of the requirements for a Master's degree in sport biology at the Norwegian University of Sport and Physical Education. The project is designed to study the following question:

> What are some of the important aspects of the organization of training for elite alpine ski racers based on training theory and the experience of coaches?
>
> - Which factors in the planning/organization of training are not only theoretically reasonable / supported, but also applicable? Likewise, which factors, although not necessarily theoretically supported in the literature, demand attention due to practical reasons?

Use of Interviews:
The experience and opinions of coaches is the central aspect of this project. Information generated in the interviews will be brought together with information obtained in a literature review to summarize aspects of the planning process.

Risks & Benefits to Participants:
Risks with participation in the study are minimal. Because the coaching world in alpine ski racing is relatively small, there is a risk that subjects will be recognized by those who are familiar with their philosophies. Whether or not this is a concern, all measures will be taken to protect the anonymity of the participant. As far as benefits are concerned, all coaches will receive a copy of the project once it is completed. In addition, it is hoped that certain components of the information assimilated in this project can be used in developing documents for coaches education in the participant's ski federation. Another important benefit is that the process of going through the interview, and the reading of opinions of other coaches and authors in training theory, may give the participating coach new ideas, new creativity, or new motivation in their thinking about the planning of training.

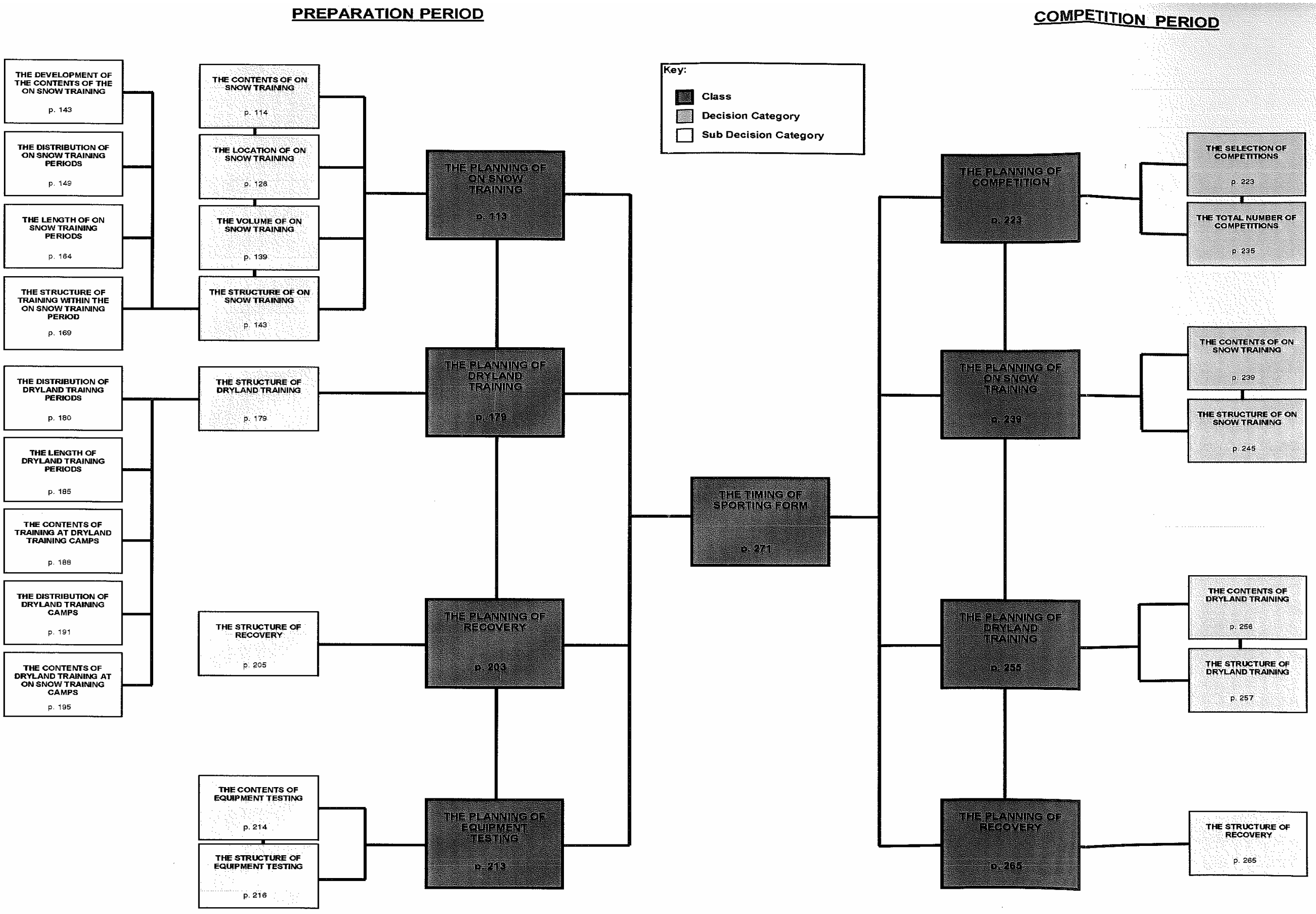
Agreement:
I agree that the information generated during my interview can be used by Robert C. Reid in his Master's thesis. I understand that my participation in the project is confidential and that all information will be reported anonymously. I also understand that my participation in this project is voluntary and that I can withdraw myself from participation at any point without having to give a reason.

Participant Signature	Date	Location

Investigator	Date	Location

APPENDIX D

OVERVIEW OF THE DECISION CATEGORIES


PREPARATION PERIOD
COMPETITION PERIOD
Key:
Class
Decision Category
Sub Decision Category
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