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**Mapping Ethical Positions Concerning a Coach's Decision to Organize a Hypoxic
Training Camp**

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Abstract

On the basis of qualitative literature data, the ethical value of hypoxic training in sports is subject to debate. The objective of the present empirical study was to map various ethical positions with regard to how individuals mentally combined several factors (the hypoxic training's objective, fairness, planning/monitoring, and method) when judging the acceptability of holding a hypoxic training camp before an event. Two hundred and sixteen participants (including 126 men and 90 women, and 186 athletes and 30 non-athletes) specified their judgement of acceptability in 36 scenarios created by cross-referencing the four factors. A cluster analysis was applied to the whole dataset. Repeated-measures analyses of variance with a 2 x 3 x 3 x 2 factorial design were then applied to each cluster. Lastly, the relationship between the clusters and the participants' characteristics was assessed in chi-squared tests. The analyses showed four ethical positions: "Moderately acceptable" for 26% of the participants, "Acceptable, depending mainly on monitoring" for 38% of the participants, "Always acceptable" for 20% of the participants, and "Never acceptable unless planned with an expert in hypoxic training and monitored by a physician" for 16% of the participants. Contrary to female participants and non-athletes, male participants and athletes tended to accept the coach's decision to organize a hypoxic training camp easily. Our study confirmed empirically that hypoxic training does not violate the spirit of sport. Sports stakeholders might refer to our study's findings to set up a public relations plan that highlights the ethical value of hypoxic training.

Keywords: hypoxic training; ethics; judgment; information integration; empirical approach

Mapping Ethical Positions Concerning a Coach's Decision to Organize a Hypoxic Training Camp

Hypoxic Training for Enhancing Sports Performance

For decades, enhancing sports performance has been the main objective of athletes in general and those competing in high-level events (e.g. the Olympic Games) in particular (Smith et al., 2010). Training methods and technologies have diversified in this quest for gold medals (Dyer, 2015). Interest in training in specific environments (notably hypoxic environments) has grown extensively in recent years (Sinex & Chapman, 2015).

Hypoxic environments are typically high-altitude (mountain) areas, which contrast with normoxic (lowland/sea level) environments. It is accepted that hypoxic/altitude training can enhance sports performance (Millet et al., 2010). However, not all athletes are lucky enough to have access to a natural hypoxic environment (i.e. the mountains) or have the financial means to attend to a training course at altitude (Girard et al., 2020). Technologies that simulate hypoxic conditions have therefore been invented (Sinex & Chapman, 2015), making it possible to benefiting from the advantages of training in the mountains while avoiding the constraints. Many training centres are now equipped with hypoxic rooms or chambers (Suchý & Waic, 2017). However, one also has to take account of the excesses of sports performance, such as doping (Sutehall et al., 2019). Environmental training methods and hypoxic technologies can therefore be considered from a doping perspective (Levine, 2006).

Hypoxic Training is not Doping

According to the World Anti-Doping Agency (WADA), a substance or method is included on the prohibited list when it meets two of the three criteria set out in the organisation's code (WADA, 2021): (i) the potential to enhance performance; (ii) a proven or potential risk to the athlete's health; and (iii) the violation of the "spirit of sport". The spirit of

sport must be considered so that the fight against doping is not only effective but also legitimate (Ahmadi et al., 2016). On the basis of a experts' report, WADA authorized the use of hypoxic methods for training purposes (Loland & Murray, 2007).

It has been shown that training carried correctly out at moderate altitude has no adverse effects on health (Levine, 2006). However, excessive exposure to hypobaric hypoxia might have tangible health risks (Lippi et al., 2007). In order to minimize possible health risks and on the basis of rigorous scientific evidence, the modalities of hypoxic training must first be assessed and validated by an expert (Loland & Caplan, 2008). A coach may have acquired this expertise personally or may consult a third party, such as a physician or a specialist in hypoxic training. Hypoxic training can also be used as a pre-acclimatization measure, in order minimize health risks at altitude (Millet et al., 2010). Although the consensus view is that hypoxic training enhances sports performance and does not endanger the health of athletes, its compatibility with the spirit of sport is subject to debate (e.g. James, 2010; Lambelet Coleman et al., 2006; Levine, 2006; Lippi et al., 2007; Loland, 2009, 2018; Loland & Caplan, 2008).

But some Ethical Questions Remain Unanswered

There is still debate over the sportsmanship and ethical value of hypoxic training, and the putative benefit of training in a hypoxic environment remains a topic of interest (Feng et al., 2023; Girard et al., 2023; Karlsson et al., 2022). According to the WADA, artificial hypoxic environments violate the “spirit of sport” criterion (Levine, 2006). Some researchers have questioned WADA's opinion (e.g. Levine, 2006; Fricker, 2005; Tamburrini, 2005; Tännsjö, 2005) whereas others have supported the WADA's stance by suggesting that hypoxic training in sport is not ethical (e.g. Lippi, 2007; Loland, 2018; Loland & Capland, 2008). This issue is divisive, and various opinions on ethical issues in hypoxic training have been examined qualitatively (e.g. James, 2010; Spriggs et al., 2005). The ethical issue of hypoxic training in sport is complex, and the debate will doubtless continue (Loland, 2018). In

particular, this complexity stems from the variables that can be considered when judging the ethical acceptability of hypoxic training (Loland, 2018).

Hypoxic training can be used to (i) acclimatize the body and reduce the risk of a drop in performance during competition at altitude (Karlsson et al., 2022) or (ii) enhance sports performance during a competition at sea level (Brocherie et al., 2017). These objectives engage with two principles of biomedical ethics: beneficence (the duty to do good) and non-maleficence (the duty to do no harm) (Beauchamps & Childress, 2001). In the context of hypoxic training, beneficence relates to something that is positive for the athlete (i.e. performance enhancement), whereas non-maleficence relates to the avoidance of harm (e.g. acclimatization to avoid a decline in performance).

Equity (fairness) is another principle of biomedical ethics and is often put forward when debating the ethical value of hypoxic training in sport. Sport must be based on the principle of equal opportunity, whereby athletes can be held accountable for their performance (Loland, 2009). The debate around hypoxic training in sport feeds on knowledge of whether this type of technology is fair, accessible, or expensive (Dyer, 2015). James (2010) also highlighted important concerns about equity: the best must win, and money can deliver the best results. Artificial hypoxic training can be expensive, and not all athletes have direct access to this technology (Girard et al., 2020).

The expert assessment of the safety of hypoxic methods can be considered as an integral part of sportsmanship (Loland, 2018). Expertise in hypoxic training can be acquired from the scientific literature or by involving an expert third party (Loland & Caplan, 2008). Medical supervision of hypoxic training reduces the risks to the athletes' health and reinforces the ethical robustness of this training method (Levine, 2006, Loland, 2009).

As mentioned above, a hypoxic environment can be natural (i.e. in the mountains) or artificial (i.e. a hypoxic room, chamber or tent). The distinction between these two

environmental conditions can shed light on the ethics of hypoxic training (James, 2010; Loland, 2018). Training at altitude might be more ethically acceptable than training under artificial conditions (Loland, 2018).

However, these variables have only been assessed qualitatively, and ethical issues in sport must be tested empirically, quantitatively, and in greater depth (Fruchart et al., 2020). The ethics of hypoxic sports training remain a topic of interest. The application of empirical approaches might help to answer the questions posed by various sporting bodies (WADA, the International Olympic Committee, sports federations, etc.) and open up avenues for further debate (Loland, 2018). In sport psychology, information integration theory (IIT; Anderson, 2008) makes it possible to examine the ethics of behaviour in sport empirically.

Information Integration Theory and Ethical Judgments

Information integration theory comes from cognitive psychology (Anderson, 2008). It can be applied to various ethical domains and can reveal the way in which people mentally combine various factors when judging the acceptability of a situation. Based on the weight given to various factors, individuals can develop an additive rule or interaction rules. In an additive rule, the same weight is given to all the factors. In an interaction rule, the weights given to the various factors differ.

In sports research, the IIT approach has notably been applied to the acceptability for selecting an injured athlete (Fruchart et al., 2020), and the acceptability for using of nutritional complements (Fruchart et al., 2019). In each study, the researchers observed several different ethical positions, which were associated with the participants' characteristics (e.g. sex and involvement in sport). The researchers emphasized that IIT could be used to investigate empirically ethical issues with regard to training environments, training technologies, and a coach's decisions about training (Fruchart et al., 2020).

The novelty and rationale of our study was to develop an empirical approach to

question the ethical issue of the hypoxic sports training. The objective of the present study was to map various ethical positions regarding the manner in which individuals integrate different factors when judging the acceptability of a coach's decision to organize a hypoxic training camp. Based on the literature on IIT and ethical judgments in sport, we formed two hypotheses (Fruchart et al., 2019, 2020). Our first hypothesis was that several different ethical positions would be found. The second hypothesis was that these ethical positions would be associated with the individuals' characteristics.

Method

Design

Our study developed an experimental design using a questionnaire given to the participants.

Participants

The study included 216 volunteer participants ($M_{age}=26.87$, $SD=9.96$): 126 men ($M_{age}=26.88$, $SD=10.82$) and 90 females ($M_{age}=26.88$, $SD=9.94$). Thirty were not athletes ($M_{age}=23.73$, $SD=5.58$) and 186 were athletes at all levels of competition (regional, national, and international) and from individual or team sports ($M_{age}=27.38$, $SD=10.43$). Based on a purposive sampling, the participants were recruited at universities or sports centres in France and did not receive any remuneration. The inclusion criteria were to be athletes or non-athletes and the ages between 18-50 years old. The exclusion criteria were a mental health concern, visual, hearing, and neurological disorders (Decroix et al., 2021).

Material

According to the methodology of the information integration theory (Anderson, 2008), the study questionnaire was composed of 36 cards, each of which contained a sports scenario, a question, and a rating scale (Figure 1). The scenarios were devised according to a four-within-subject-factor design: (i) the hypoxic training's objective (acclimatization, or

performance enhancement), (ii) fairness (unfair or fair), (iii) planning/monitoring (no planning or monitoring, planning with an expert in hypoxic training, or planning with an expert and monitoring by a physician during the training camp), and (iv) the hypoxic training method (artificial hypoxia, artificial and natural hypoxia, or natural hypoxia). All combinations of these factors yielded $2 \times 2 \times 3 \times 3 = 36$ scenarios. The question was “To what extent do you think that the coach’s decision is acceptable? The 11-point rating scale beneath each scenario had a left-hand anchor of “*Not at all acceptable*” (score: 0) and a right-hand anchor of “*Completely acceptable*” (score: 10). This type of scale was used for studying ethical judgment in sports domain (Fruchart et al., 2020; Fruchart et al., 2019). According to the Anderson (2008)’s recommendations, the questionnaire was proposed to 5 individuals to confirm its validity in testing its clarity, comprehensibility, and appropriateness.

Procedure

The study procedures were approved by the local independent ethics committee (University of Toulouse, Toulouse, France; reference number: 2020-328) and by the dean of the faculty. The experiment took place in a quiet room. Each participant was assessed alone. After an investigator had given the participants information on the study’s objectives and procedures, the participants gave their written consent. The participant first read a set of sports scenarios in which a coach decided to organize a hypoxic training course and then rated the acceptability of this decision.

The experiment comprised a familiarization phase and then an experimental phase. In the familiarization phase, the participant was confronted with six scenarios comprising the set of stimuli. The participant was allowed to change his/her answers. In the experimental phase, the participant was confronted with 36 scenarios and was not allowed to change his/her answers. Each session lasted for 30 to 40 minutes.

Data Analysis

The data were analyzed using Statistica software (version 8, StatSoft Inc., Tulsa, USA).

For each rating, the point checked by the participant on the response scale was converted into a numerical value from 0 to 10. The numerical values were analyzed statistically and graphically. Given that we expected to see marked differences in the responses between participants, a two-step cluster analysis was applied to the raw data. Firstly, we used a hierarchical cluster analysis (Ward's method, with measurement of a squared Euclidean distance) to determine the number of clusters, based on agglomeration schedule coefficients. The number of clusters was confirmed in a repeated-measures analysis of variance (ANOVA), with the judgment as a dependant variable, the factors as independent variables, and cluster membership as a between-subject variable. Tukey's post-hoc test was applied to the cluster membership result. A significant cluster variable confirms the validity of the cluster solution (Aldenderfer & Blashfield, 1984). Secondly, we used a K-means analysis (with Euclidian distances) to form the clusters. This approach has already been used to map ethical positions in sport (e.g. Fruchart et al., 2020).

Next, we conducted repeated-measures ANOVAs on the data from each cluster, with the judgment as the dependant variable and the four factors as independent variables. Repeated-measures ANOVAs were used because all participants were confronted with each scenario from the experimental design. Given the large number of comparisons (14), we used Bonferroni's correction (Li et al., 2016) and a significance threshold was set to $p < .004$ (i.e. $.05/14$).

Lastly, chi-squared tests were used to determine whether the clusters were associated to the participants' characteristics.

Results

Clusters Analysis

The hierarchical cluster analysis gave a four-cluster solution ($K=4$) (Figure 2). A

repeated-measures ANOVA and a post-hoc test showed that the *cluster* factor was significant, ($F(3,212)=281.31; p < .001; \eta^2_p=.80$) (Tables 1 and 2). Tukey's test showed that each cluster was significantly different from all the others ($p < .001$: Cluster 1 ($M=4.93; SD=0.09$); Cluster 2 ($M=5.49; SD=0.07$); Cluster 3 ($M=7.54; SD=0.10$), and Cluster 4 ($M=3.15; SD=0.11$), confirming the validity of the four-cluster solution.

Repeated-Measure ANOVA and Graphical Analysis in each Cluster

Cluster 1 (n=56, accounting for 26% of the participants) was named "Moderately acceptable" because the mean response was close to the middle of the 0-10 scale. The curves were separate (indicating an effect of *fairness*), had a clear slope (indicating an effect of *planning/monitoring*), and were parallel (characterising an additive integration rule). The *planning/monitoring*, *fairness*, and *method* factors all had a significant effect (see Table 2). Tukey's test showed significant differences between the three modalities of the *planning/monitoring* factor. For the *method* factor, Tukey's test showed significant differences between the "Artificial hypoxia" and "Natural hypoxia" modalities ($p < .001$), and between the "Artificial and natural hypoxia" and "Natural hypoxia" modalities ($p < .001$). There was no significant difference between the "Artificial hypoxia" and "Artificial and natural hypoxia" modalities ($p=.045$).

We called Cluster 2 (n=82, accounting for 38% of the participants) "Acceptable, depending mainly on planning/monitoring" because the participants' judgment was primarily influenced by the *planning/monitoring* factor. The curves were separate (indicating an effect of *fairness*), sloped from the bottom to the top of the graph (indicating a very strong effect of *planning/monitoring*), and were parallel (indicating the use of an additive integration rule). As with Cluster 1, the *planning/monitoring*, *fairness*, and *method* factors each had a significant effect. However, the members of Cluster 2 clearly gave more importance to *planning/monitoring* than *fairness* and *method* (Table 2). Tukey's test showed significant

differences between the three modalities of the *planning/monitoring* and *method* factors ($p < .001$).

Cluster 3 (n=43, accounting for 20% of the participants) was named “Always acceptable” because the mean responses were always above the middle of the scale. The curves are in the upper part of the panel. The curves were separate and had a slope (indicating effects of *fairness* and *planning/monitoring*) and were parallel (indicating the use of an additive integration rule). The four factors had a significant effect. Tukey’s test showed significant differences between the three modalities of the *planning/monitoring* factor. For the *method* factor, Tukey’s test showed significant differences between the “Artificial hypoxia” and “Artificial and natural hypoxia” modalities ($p < .001$), and between the “Artificial hypoxia” and “Natural hypoxia” modalities ($p < .001$). There was no difference between the “Artificial and natural hypoxia” and “Natural hypoxia” modalities ($p=.284$).

Cluster 4 (n=35, accounting for 16% of the participants) was named “Never acceptable unless planned with an expert in hypoxic training and monitored by a physician” because (i) the mean responses were in the lower part of the 0-10 scale, and (ii) the coach’s decision was only acceptable when the hypoxic training camp was to be planned with an expert and monitored by a physician. The curves had a steep slope (indicating a major effect of the *planning/monitoring* factor) and separate (indicating an effect of the *fairness* factor). Both factors were significant. In contrast to the three first clusters, the *planning/monitoring* x *fairness* interaction had a significant effect in Cluster 4 - showing that the cluster’s members used an interaction integration rule. More precisely, the fact that the curves formed a fan open to the right showed that the cluster members developed a conjunctive integration rule.

Pearson’s Chi-Squared Tests

The 2 (male/female) × 4 (clusters) Pearson’s chi-squared test was significant, $\chi^2(8)=17.42$, $p=.02$ (Table 3). The proportion of females was significantly higher in clusters 1

and 4 and significantly lower in clusters 2 and 3. The 2 (non-athlete/athlete) \times 4 (clusters) Pearson's chi-squared test was also significant, $\chi^2(3)=11.90, p=.007$. The proportion of athletes was significantly higher in clusters 2 and 3 and significantly lower in cluster 4.

Discussion

The objective of our investigation was to map various ethical positions with regard to the manner in which people mentally combine different factors (the hypoxic training's objective, fairness, planning/monitoring, and method) when judging the acceptability of coach's decision to organize a hypoxic training camp. Our first hypothesis (that different ethical positions would be found) was confirmed: four ethical positions (clusters) were identified.

The members of Cluster 1 judged the coach's decision to organize a hypoxic training camp to be moderately acceptable. Furthermore, they judged the decision to be more acceptable when (i) all athletes could attend the hypoxic training camp (i.e. fairness), (ii) an expert in hypoxic training helped the coach to plan the camp, (iii) a physician monitored the athletes on a daily basis during the camp, and (iv) the training method was natural (i.e. at altitude).

The members of Cluster 2 judged the coach's decision to organize a hypoxic training camp to be acceptable essentially when an expert in hypoxic training helped the coach to plan the camp and when a physician monitored the athletes on a daily basis during the camp. This result confirms that for certain individuals, expertise in hypoxic training and medical follow-up are essential ethical elements for the organization of a hypoxic training camp (Loland, 2018).

The members of Cluster 3 judged the coach's decision to organize a hypoxic training camp to be acceptable in all situations. This ethical position is clearly in line with the "thin" interpretation of the athlete's performance (Loland & Capland, 2008). When preparing for an

event, the “thin” interpretation rejects restrictions on performance-enhancing methods other than those regulated by general rules. It promotes radical ideals of human enhancement and performance with the help of modern technologies, such as a hypoxic environment (Miah, 2005).

The members of Cluster 4 judged the coach’s decision to organize a hypoxic training camp to be rarely acceptable. The decision was only acceptable when an expert in hypoxic training helped the coach to plan the camp and when a physician monitored the athletes on a daily basis during the camp. This ethical position is in line with the “thick” interpretation of sports performance and relates the WADA’s “spirit of sport”. In this view, performance in competitive sport should result from the athletes’ efforts alone. Hypoxic training does not appear to be acceptable with this “thick” approach. However, this obstacle is largely mitigated when an expert in hypoxic training helps the coach to plan the camp and when a physician monitored the athletes on a daily basis during the camp. This finding confirms the significant weight given by individuals to expertise and medical follow-up in the implementation of a hypoxic training camp (Loland, 2018).

These results confirm the findings found in previous studies on judgment of acceptability of selecting an injured athlete (Fruchart et al., 2020) and judgment of acceptability of using nutritional complements (Fruchart et al., 2019). As well as identifying different ethical positions, our study has another similarity with these studies. They identified a “never acceptable” ethical position that was opposed to other more acceptable ethical positions. Furthermore, in terms of information integration theory and cognitive rules, overall similar response patterns from the “never acceptable” ethical position were found in these studies. The members of the “never acceptable” ethical position used an interaction rule for judging the acceptability of the sports situation. Whereas the members in more ethically acceptable positions used an additive cognitive rule. Other studies on judgment of

acceptability in sport would be necessary to confirm this trend.

Our second hypothesis was that the various ethical positions would be associated with individuals' characteristics (sex and involvement in sport). The participants' sex was indeed associated with the clusters' composition. The male participants tended to accept the coach's decision to organize a hypoxic training camp easily, whereas the female participants approved decision less readily. The participants' involvement in sport was also associated with the clusters' composition. The athletes tended to accept coach's decision to organize a hypoxic training camp easily, whereas the non-athletes were more reluctant to accept the decision. These findings are coherent with other empirical studies of sports ethics, in which the ethical judgment differed as a function of the individuals' characteristics (e.g., Fruchart et al., 2020).

Our empirical investigation confirmed the existence of inter-individual differences in information integration when judging the acceptability of a hypoxic training camp, as suggested by the results of qualitative studies (e.g. James, 2010; Spriggs, 2005). Our quantitative findings illustrate the qualitative debate between researchers in this field of ethics. The ethical judgment of performance enhancement depends on the context (Loland, 2018) and the manner in which individuals combine mentally the elements of context. Then, in using cluster analyses and information integration theory (Anderson, 2008), it is possible to clearly map different ethical positions and to associate them with participants' characteristics (Fruchart et al., 2020).

Limitations and Future Researches

Our study had some limitations. Firstly, we looked at only one training method; it would have been interesting to investigate other technologies for enhancing sports performance, such as cryo strategies (Muniz-Pardos et al., 2021) and assistive technologies for able-bodied sportspeople (Deyer, 2015). Secondly, our participants were adults. Ethical judgments in sport could also be investigated from a developmental perspective by

questioning younger people (Fruchart et al., 2019). Thirdly, our work focused on three of the four principles of biomedical ethics: fairness, beneficence, and non-maleficence (Beauchamps & Childress, 2001). The fourth principle (autonomy, allowing the athlete to make informed choices and give his/her informed consent) could be assessed in future studies of ethics in sport. Lastly, the use of hypothetical scenarios based reasoning has its limitations such as they are unable to capture the complex social, emotional and motivational pressures inherent to real moral decisions (Feldmann et al., 2012). In the same manner than the ecological validity of IIT has been found (Fruchart et al., 2007; Legall et al., 2024) it would be necessary to test in real condition the acceptability of hypoxic training.

Conclusion

We mapped four different ethical positions for the acceptability of coach's decision to organize a hypoxic training camp. These positions were based on how individuals cognitively combine four factors (the hypoxic training's objective, fairness, planning/monitoring, and method). They were associated with sex and involvement in sport of the participants. Implementing Anderson's (2008) information integration theory might provide an empirical insight to this type of ethical issue.

Our study's main ethical finding is that only 16% of the participants (those in Cluster 4) considered that the coach's decision to organize a hypoxic training camp was unacceptable. This perspective supports the WADA's decision to authorise the use of hypoxic training and indicates that hypoxic training does not violate the spirit of sport. Furthermore, this finding might boost interest in high-altitude training camps. Lastly, in the run-up to future major sporting events, it might be useful for organizers and/or teams to set up a public relations plan that highlights the ethical value of hypoxic training.

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Table 1*Main Results of the ANOVAs Performed on Clusters 1 to 4*

Factor	Effect		Error		<i>F</i>	<i>p</i>	η^2_p
	<i>df</i>	<i>MS</i>	<i>df</i>	<i>MS</i>			
Cluster 1							
Objective	1	29.53	55	6.35	4.65	.035	.08
Fairness (F)	1	1753.17	55	24.23	72.35	<.001	.57
Planning/Monitoring (PM)	2	1341.62	110	7.06	189.92	<.001	.76
Method	2	422.10	110	16.31	16.09	<.001	.32
F x PM	2	3.34	110	2.76	1.21	.301	.02
Cluster 2							
Objective	1	28.88	81	5.23	5.52	.021	.06
Fairness (F)	1	834.99	81	6.99	119.48	<.001	.60
Planning/Monitoring (PM)	2	10525.07	162	9.59	1102.31	<.001	.93
Method	2	233.01	162	3.85	60.52	<.001	.43
F x PM	2	6.98	162	2.38	2.93	.056	.03
Cluster 3							
Objective	1	66.56	42	22.18	3.00	<.001	.35
Fairness (F)	1	591.63	42	15.65	37.80	<.001	.47
Planning/Monitoring (PM)	2	789.12	42	10.26	76.93	<.001	.65
Method	2	75.30	84	48.30	21.37	<.001	.34
F x PM	2	2.25	84	2.85	0.79	.459	.03
Cluster 4							
Objective	1	50.40	81	6.52	7.73	.009	.19
Fairness (F)	1	603.48	81	12.19	49.50	<.001	.59
Planning/Monitoring (PM)	1	4706.92	81	22.85	206.03	<.001	.85
Method	1	1.69	81	3.18	0.53	.590	.01
F x PM	2	189.92	162	5.13	37.02	<.001	.52

Note. The threshold for statistical significance was set to $p < .004$.

Table 2*Mean (SD) Scores for the Four Factors in each Cluster*

	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
	4.93	0.09	5.49	0.07	7.54	0.10	3.15	0.11
Factor								
OBJECTIVE								
Increasing performance	4.81	0.47	5.39	0.32	7.33	0.57	2.95	0.66
Acclimatization	5.05	0.47	5.59	0.36	7.75	0.45	3.35	0.41
FAIRNESS								
Unfair	4.00	0.53	4.95	0.38	6.92	0.67	2.46	0.69
Fair	5.87	0.70	6.02	0.34	8.16	0.60	3.84	0.53
PLANNING/MONITORING								
No planning or monitoring	3.52	0.51	2.15	0.41	6.24	0.72	0.71	0.37
Planning with an expert in hypoxic training	4.93	0.47	5.63	0.40	7.68	0.42	1.78	0.59
Planning with an expert in hypoxic training and monitoring by a physician	6.35	0.34	8.70	0.28	8.70	0.48	6.96	1.11
METHOD								
Artificial hypoxia	4.23	0.51	4.98	0.29	7.11	0.51	3.08	0.48
Artificial and natural hypoxia	4.77	0.49	5.52	0.31	7.67	0.41	3.19	0.45
Natural hypoxia	5.80	0.64	5.96	0.31	7.84	0.43	3.20	0.40

Table 3*Composition of the Four Clusters in terms of Sex and Involvement in Sport*

Participants	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
SEX					
Females	27 (30%)	31 (34.44%)	9 (10%)	23 (25.56%)	90
Males	29 (26.9%)	51 (40.48%)	34 (26.98%)	12 (9.52%)	126
Total	56	82	43	35	216
INVOLVEMENT IN SPORT					
Non-athletes	8 (26.67%)	8 (26.67%)	3 (10%)	11 (36.67%)	30
Athletes	48 (25.81%)	74 (39.78%)	40 (21.51%)	24 (12.90%)	186
Total	56	82	43	35	216

Note. The threshold for statistical significance was set to $p < .02$ in the 2 (Sex) x 4 (Cluster) Pearson's chi-squared test and $p < .007$ in the 2 (Involvement in sport) x 4 (Cluster) Pearson's chi-squared test.

Figure 2

Effect of Planning/Monitoring and Fairness on Judgments of Acceptability of a Coach's

Decision to Organize a Hypoxic Training Camp, by Cluster

