

Mental and physical attributes defining world-class Norwegian athletes: Content analysis of interviews

R. Boes¹, H. S. Harung², F. Travis¹, A. M. Pensgaard³

¹Center for Brain, Consciousness and Cognition, Maharishi University of Management, Fairfield, Iowa, USA, ²Oslo and Akershus University College, Oslo, Norway, ³The Norwegian School of Sport Sciences, Oslo, Norway

Corresponding author: Frederick Travis, PhD, Center for Brain, Consciousness and Cognition, Maharishi University of Management, 1000 N 4TH FM 683, Fairfield, IA 52557, USA. Tel: +1-641-472-1209; Fax: +1-641-470-1316; E-mail: ftravis@mum.edu

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This study reports the results of a content analysis of interviews with 28 Norwegian world-class athletes and 28 controls, matched for gender, age, and type of sport. Semi-structured interviews explored their perceptions of their best performance. The interviews were analyzed using the ATLAS.ti and yielded 20 higher-order codes. Nine higher-order codes were categorized as inner-oriented, five were categorized as outer-oriented, and six were a combination of inner- and outer-oriented. Statistical analysis, using the Mann-Whitney test, showed significant group differences for seven higher-order codes: (a) two outer-oriented codes relating to “mastery – achievements” and “training – outer”; and (b) five inner-oriented codes relating to

“mental preparation,” “self-reliance,” “training – inner,” “wholeness,” “performance – inner,” and “growth orientation.” These findings highlight the importance of both inner- and outer-oriented development for high-level achievement in sports – the “mental game” is as important as the physical game, both during training and competitions. Previously published quantitative data reported higher levels of brain integration, faster habituation to a loud tone, and higher ego and moral development in these world-class athletes. These findings are interpreted in light of a Unified Theory of Performance, which proposes that higher mind-brain development provides a basis for higher performance in any activity.

There are a lot of people training the same way, physically. They have the same strength, everything is the same. But why is someone beating others? (Orienteer)

What attributes, strategies, and training programs distinguish winning athletes from others and allow them to consistently excel at top-level? What gives them their competitive edge? Success in sports depends on physical factors such as endurance, technique, strength, anatomical capacities, flexibility, and mind-body coordination (Jones, 2008). The importance of these factors may vary depending on the sport – while endurance is important for long-distance runners, physical strength, technique, and mind-body coordination may be essential for downhill skiers. Although the main emphasis in sports still seems to be on physical training and performance – the outer dimension – the last 25 years have seen an increased interest in the psychological aspect of sports (Thelwell & Greenless, 2003; Gould & Maynard, 2009). This broader perspective brings out the importance of a synergy between physical and mental factors and training for a successful athletic outcome (Gould & Maynard, 2009).

Importance of mental attributes in sports

Mental abilities proposed as essential for success in sports include mental readiness, attentional focus, strong commitment, clear goals, simulation training, mental training plans including imagery practice, and distraction control (Orlick & Partington, 1988). Also, “mental toughness” and “ability to cope with stress and perform under pressure” are important mental skills (Jones et al., 2002, p. 206). The Norwegian cross country skier Thomas Alsgaard, who won 11 gold medals in Olympic Games or World Championships, wrote that the main criteria for his success are honesty (toward oneself), continuous evaluation, patience, and enjoyment (Alsgaard, 2008). He continues, “the difference between the best and the second best lies in the head” (p. 114).

Several studies support the importance of development of mental skills and other aspects of inner development for success in sports. Gould et al. (1992) wrote that top performers reported greater preparedness for unforeseen events, better ability to narrow their focus of attention, and extensive use of mental practice, compared with less successful athletes. In their study of Olympic athletes, Orlick and Partington (1988) found mental readiness to be the only statistically significant

factor linked with final Olympic ranking out of mental, physical, and technical factors. Hardy et al. (1996) pointed out that research on differences between elite and non-elite athletes shows greater levels of inner values such as self-confidence, anxiety control, and attention control in top athletes. Similarly, an interview study by Sugiyama and Inomata (2005) reported on psychological states or inner qualities, leading to an experience of an optimal inner state, at times called a "flow state" in top athletes, where they are feeling relaxed, self-confident, and highly motivated. Reviewing research studies on psychological preparation for Olympic performance, Gould and Maynard (2009) noted the importance of "cognitive, emotional, and behavioral strategies athletes use to arrive at an ideal performance state or condition" (p. 1393).

Orlick and Partington (1988) noted that quality physical training and mental preparation for competition were consistently mentioned as important for success in world-class athletes, highlighting the value of both mental and physical preparation. Extending this more comprehensive view, this paper is part of several research studies on the psycho-physiological markers of successful performance. In this series, we are investigating the significance for performance not only of higher levels of psychological development – cognitive, emotional, moral, and ego or self-development – but also in terms of global brain functioning and the frequency of peak experiences.

Mind-brain development

Is there a common dimension underlying the acquisition and application of physical and mental skills? A Unified Theory of Performance proposes that higher mind-brain development is the basis for higher performance across different domains (Harung et al., 1996, 2011; Travis et al., 2011). Continuous brain development is considered to underlie cognitive, emotional, moral, and ego or self-development (Travis & Brown, 2011).

Mind-brain development has been operationalized by three measures. The first marker is the score on the Brain Integration Scale. The Brain Integration Scale comprises three electroencephalogram-derived measures: broad band frontal coherence (how well different parts of the brain interact), relative global alpha power (indicating restful alertness), and brain preparatory response during challenging tasks (how efficiently or economically the brain functions; Travis et al., 2002). Higher scores on this scale correlate positively with higher moral reasoning, higher emotional stability, and more openness to experience, and correlate negatively with anxiety (Travis et al., 2004).

Moral reasoning is a second marker of mind-brain development. Higher levels of moral reasoning require a larger context for decision making, such as the effect of actions on others, on the immediate environment and on

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society at large. Higher moral reasoning is correlated with higher levels of ego or self-development and with cognitive development (Gibbs et al., 1990).

Peak experiences are a third marker of mind-brain development. Peak experiences are instances of ego-transcendence, glimpses of an advanced range of development that lies beyond ordinary daily experience, and psychological development (Maslow, 1968; Alexander et al., 1990). Characteristics of performance during peak experiences include inner silence and deep relaxation in dynamic activity, easy and effortless action, playfulness, strong happiness, reliable intuition, and sustained high-level performance (Maslow, 1968; Ravizza, 1977; Jackson & Csíkszentmihályi, 1999; Alsgaard, 2008).

These markers of mind-brain development are supported by research in sports. Thirty-three Norwegian world-class athletes, in comparison to matched controls, had (a) higher scores on the Brain Integration Scale; (b) higher levels of ego or self-development; and (c) higher levels of moral reasoning (Harung et al., 2011). The world-class athletes also habituated faster to repeated loud tones (a measure of the adaptability to irrelevant distractions). There were no differences in peak experiences between these two groups. Two additional research projects reported higher overall mind-brain development – as measured by more frequent peak experiences, higher Brain Integration Scale scores, and higher levels of moral reasoning – in top-level managers and professional classical musicians compared with average-performing controls (Harung et al., 2009; Travis et al., 2011).

These same 66 athletes were interviewed to probe inner experiences during training and competition that underlie quantitatively measured differences between groups. This paper presents the content analysis of those interviews. This analysis will articulate themes that describe the construct of mind-brain development and give depth and support to the previously reported quantitative findings. This cross-sectional study is not designed to test cause-effect relations; it is designed to further explore the inner dimension of world-class athletes through interviews.

Materials and method

Participants

The National Olympic Training Center in Norway (Olympiatoppen) and the Norwegian School of Sport Sciences (Norges Idrettshøgskole) identified 59 athletes who met three criteria: (a) placement among the 10 best in Olympic Games, World Championships, or World Cups for at least three seasons; (b) being active at the top-level within the last 5 years; and (c) at least 25 years of age. These individuals were contacted and 33 athletes agreed to participate in the study. They constituted the world-class performance group, consisting of 10 female and 23 male athletes. Their average age was 34.0 ± 1.2 years and ranged from 26 to 48 years. Mentally they were stable, scoring in the normal range on tests of ego development and moral reasoning (Harung et al., 2011); physically they were healthy – athletes in both groups were still

active in sports. Next, 33 average-performing athletes were selected as controls. They did not normally place among the top 50% in the Norwegian Championships, but had been active in training and competition at the senior level for at least three seasons and were 10 female and 23 male athletes, with an average age of 34.8 ± 1.3 years and ranged from 26 to 49 years. The two groups were also matched for gender and type of sport. Types of sports were (a) endurance sports (e.g., cross country skiing, biathlon, and long-distance running); (b) technical sports (e.g., downhill skiing, shooting and offshore boat racing); and (c) team sports such as soccer and handball. All subjects gave informed consent to be part of the study. This study was approved by the Institutional Review Board at Maharishi University of Management.

Procedure

Each athlete was interviewed in a semi-structured interview format using probe questions to explore the responses. Interviews were recorded in full with an audio recording device and transcribed in English word-for-word with some editing for grammatical reasons or to make the content more understandable. Athletes were sent a copy of the interview transcription for approval after the interview.

Interview protocol

The interview followed the Behavioral Event Interview Structure (Michael et al., 1994). The interview started with:

I would like you to describe what happens when you perform at your very best. Please describe the specific situation, your inner experiences in body and mind, and how you relate externally to others and the environment during optimal performance. You may also want to talk about what happens before and after such instances.

The intention of the question was to bring out mental and physical experiences during high-level performances. By asking about concrete instances rather than abstract ideas or hypothetical situations, experiences and underlying principles reflected in participant performances were expected to be articulated.

Data analysis

All interviews were content-analyzed by the first author, who was blinded to group membership. Content analysis was conducted using the ATLAS.ti 4.2 software program (BioSemi BV, Amsterdam, Netherlands). This program allows the researcher to read through the transcriptions and highlight “units of meaning” – words or phrases that express a unique and coherent idea. In Atlas-Ti, these phrases are called “quotations.”

Once quotations had been highlighted, each was assigned a code. For example, an athlete said: “The training gave me a lot of confidence.” This was coded as “confidence.” After coding of quotations was completed, codes with three or fewer quotations were reviewed to see if they fit into a more general code. Next, codes were grouped by common themes into higher-order codes. A Mann-Whitney test assessed group differences in the frequency that codes, making up the higher-order codes, were mentioned in both groups. A non-parametric test was used because the data were not normally distributed. Of the 66 interviews, 6 were in handwritten notes because of equipment failure and were not included in the analysis because these notes did not contain complete information. This yielded 60 interviews, 28 in the world-class group, and 32 in the comparison group. The statistical analysis was performed on 28 matched subjects in each group.

Results

The interview transcriptions comprised 139 296 words and 366 pages for the world-class group and 75 961 words and 284 pages for the comparison group. The content analysis yielded 161 codes in the world-class group and 163 codes in the control group. Most codes appeared both in the interviews of the world-class athletes and controls. Two codes were unique to the world-class group: foresight and interaction; four codes were unique to the comparison group: differentiating-the-top, focus-best-competitions, focus-on-success, and obstacles.

The 324 codes were grouped into 20 higher-order codes, separated into three categories: (a) five that referred to outer-oriented higher-order codes; (b) nine that referred to inner-oriented higher-order codes; and (c) six that were a combination of inner- and outer-oriented higher-order codes. Table 1 presents the higher-order codes, their average frequency of appearance in the interviews with both groups, and significance levels from the Mann-Whitney test.

The Mann-Whitney test showed significant group differences on seven higher-order codes: (a) outer-oriented: mastery – achievement and training – outer; and (b) inner-oriented: self-reliance, training – inner, wholeness, performance – inner, and growth orientation. None of the higher-order codes that were a combination of inner- and outer-oriented values reached significance.

The significant differences in outer-oriented codes might be expected in high-performing athletes. Success in sport requires rigorous training and focus on physical development. The significant differences in mental super-codes may be unexpected. However, there is a growing understanding in sports that success depends on both physical and mental attributes. For instance, recent research in Sweden reported that elite soccer players score significantly higher than low-division players on measures of creativity, response inhibition, and cognitive flexibility. In fact, the top scorers in elite soccer placed among the top two percentages of the whole Swedish population on this measure (Vestberg et al., 2012).

Sample statements from the higher-order codes that were significantly different between groups are presented next. These statements allow the reader to see the types of experiences that were included in the higher-order codes that differentiated the groups. These statements also give details of the inner world of the high-performing athletes and what might have helped them excel in their sport.

Examples from the content analysis: outer-oriented higher-order codes

Training – outer

This higher-order code included training strategy, coaching, support, competition, competition strategy, and

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Table 1. Average frequency (standard deviation) of higher-order codes in the interviews, and results of the Mann-Whitney test of group differences in these frequencies

Higher-order codes	Number of times a code was mentioned		<i>P</i> -value
	World-class	Controls	
Outer variables			
Training – outer	17.38 (5.3)	7.63 (4.3)	0.000
Mastery – achievement	23.3 (7.2)	9.7 (5.6)	0.000
Poor performance	10.7 (8.5)	6.3 (4.6)	ns
Performance – outer	17.20 (10.3)	13.80 (6.2)	ns
Compare best-worst competitions	23 (9.2)	13 (7.2)	ns
Inner variables			
Training – inner	22.7 (6.2)	12.32 (5.7)	0.002
Performance – inner	29.1 (4.8)	17.9 (5.2)	0.005
Self-reliance	21.9 (6.3)	11.1 (4.7)	0.001
Wholeness	8.8 (3.1)	4.3 (2.1)	0.026
Growth orientation	6.1 (2.4)	2.9 (0.9)	0.057
Ambition	4.2 (2.5)	6.8 (4.7)	ns
Calm emotions	5.8 (3.8)	5.2 (4.2)	ns
Emotions – positive	25.9 (8.4)	21.13 (7.2)	ns
Emotions – negative	14.7 (4.5)	16.3 (7.3)	ns
Inner/outer variables			
Positive personal life	11.5 (4.2)	10.5 (3.6)	ns
Negative personal life	12.5 (5.4)	16.0 (6.4)	ns
Effect outside sports	32.0 (11.9)	14.0 (5.3)	ns
Challenges	19.0 (7.4)	6.5 (3.4)	ns
Heaviness	3.0 (1.2)	7.5 (3.4)	ns
Combined	21.0 (9.2)	17.7 (8.9)	ns

ns, *P* > 0.05.

competition tactics. One top performer explained how he established effective routines:

It was maybe one of my greatest success factors that I found a good routine for . . . training . . . especially in competition situations . . . So, I did almost exactly the same thing whether it was a world cup competition or national competition, or world championships, or an Olympic Game. (Combined Nordic skier)

Mastery – achievements

This higher-order code included achievements, mastery, best competitions, goal formulation and attainment, handling challenges and competitors, and peak performance. Goal formulation, for example, was described by two world-class athletes in terms of:

You have to have a big goal, like far ahead, but it's the small goals that will keep you going and going, and finally you will reach that big goal . . . take these small steps to a focused goal, and then you will reach this [bigger] goal. (Tae Kwon-do)
I've made this goal very strong for me. I've made this commitment to myself. This is something I really, really want to do. (Orienteer)

Examples from content analysis: inner-oriented higher-order codes

Two of the inner-oriented higher-order codes described mental skills that could be developed with practice: training – inner and performance – inner. The three other higher-order codes described fundamental attributes of the individual that could be considered more part of their personality and are less readily developed. These three codes are self-reliance, wholeness, and growth orientation.

Mental skills

The higher-order code of *training – inner* contains procedures used to enhance the effectiveness of training, including analysis, evaluation, focus, mental preparation, strategy, strength, and planning. Planning and evaluation was a key mental factor. For instance,

I think I am probably going to start somewhere a year ahead, and I will start planning the training . . . And then you try to figure out where [to train to get] easier training, and make some kind of plan. And, then this plan never ends up being what you really do, but you still need to plan. (Skater)

The second higher-order code that fit into the category of mental skills was *performance – inner*. Athletes reported using mental control, visualization, planning, evaluation, and analysis in order to prepare for and excel in competitions. One athlete explained:

When I am at the starting line at a World Championship or Olympic Game, then I have already run this race a hundred times in my head, or at the back of my head . . . I have many more hours with technical training in bed than what I have out in the forest. (Cross country skier)

These top athletes remain undisturbed and focused on the task at hand, thus permitting inner factors to more easily guide the performance toward the goal.

Fundamental attributes

Three higher-order codes appeared to reflect fundamental characteristics of the athlete rather than mental skills that could readily be developed. *Self-reliance* was the first of these codes. It included self-responsibility, self-sufficiency, self-referral, and intuition. For instance, an athlete explained:

I have never been very preoccupied with what other people think. I have stood my grounds on the choices that I've made. I have never been afraid of what other people think about me and my performances. I have gone my own ways. (Runner)

The top athletes took full responsibility for their own life, and performance, and did not primarily rely on the coach, the team, or other advisors.

The second higher-order code in this category was *wholeness*. It consisted of wholeness, boundary breaking, free of limitations, oneness, and wide angle perception. An athlete remarked:

I am after the wholeness. Generally speaking, I have this feeling of wholeness. The small details are rather unessential. It is the total picture and wholeness that is important. It is this wholeness I have been feeling and looking for. If this wholeness is there, you may say that things work out well. (Cross country skier)

These statements emphasize the importance of experiencing the wholeness or the “total picture” of the situation for these top-performing athletes. This experience appears to help organize and guide the overall strategy used to achieve the goal.

The last higher-order code that reflected fundamental characteristics of the athlete was *growth orientation*. It consisted of improvement, progress, optimization, and priority of process. For instance, an athlete explained:

What can I do to improve myself? . . . My son would often ask me why I was training two times a day since I already was the world's best. I would reply that if you think you are the best, you are done. You always have to believe that there is something you can improve upon. (Runner)

It is the sense of continuous improvement and growth that energized the top-level athletes to excel even beyond their own personal bests.

Discussion

Two points stand out in this analysis. First, there were significant group differences in five out of nine inner-oriented higher-order codes (56%) and in two out of five outer-oriented higher-order codes (40%). The world-class athletes valued both inner- and outer-oriented values as the basis for their success. When physical fitness, strength, and technique are similar across athletes, mental factors decide who wins in the end. Second, the inner-oriented higher-order codes contained fundamental attributes such as self-reliance, wholeness, and growth orientation, which are developmentally dependent, and mental skills such as focus, planning, and decision making, which are mainly practice-dependent. The developmentally dependent attributes are not readily changed by training, but are clearly necessary for successful performance in these athletes.

The three developmentally dependent inner-oriented codes – self-reliance, growth orientation, and wholeness – reflect mature psychological development or post-conventional development. Post-conventional development, which today is reached by only about 10% of adults, brings with it a transformation to such mental attributes as more holistic perspective, increased effectiveness and purposefulness, greater autonomy and self-reliance, growing intrinsic motivation, long-term perspective, and a shift from deficiency orientation to growth orientation (Maslow, 1968; Cook-Greuter, 2000; Rooke & Torbert, 2005). While we cannot know how the world-class athletes achieved higher psychological development, differences in this dimension distinguished them from the controls.

These qualitative findings supplement the quantitative measures reported by Harung et al. (2011) in these same two groups of athletes. In the earlier study, the world-class athletes exhibited higher levels of moral and ego development, higher levels of brain integration, and faster habituation to loud sounds compared with controls. Higher levels of moral and ego development require a larger mental framework to process experience; this larger framework would include the subjective concepts of self-reliance, growth orientation, and wholeness. Higher levels of brain integration and habituation to loud sounds have been linked to greater emotional stability, higher moral reasoning, and greater openness to

experience. As all experiences are processed by the brain, a more integrated brain would lead to a more integrated experience, which would support the descriptions of these athletes of greater psychological maturity.

These data fit the Unified Theory of Performance that identifies higher mind-brain development as the basis for higher performance across different domains. Higher mind-brain development was operationalized by three quantitative measures in previous work – scores on the Brain Integration Scale, and levels of moral reasoning and of peak experiences. The more qualitative measures from this study – self-reliance, growth orientation and wholeness – further define the concept of mind-brain development. The level of mind-brain development appears to be a global measure that defines access to and ability to allocate inner resources to learn specific skills and guide behavior.

Perspectives

What allows some athletes to consistently excel? How can individuals maintain top placement over extended

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periods of time? Mental skills, psychological attributes, physical training strategies, coaching and social support have been increasingly utilized in sport. Some skills can be learned; others are developmentally dependent. The world-class athletes in the present study had higher levels of mind-brain development compared with controls in a previous quantitative study. In the present interview study, the top performers more frequently used terms that were in the categories of self-reliance, growth, and wholeness in describing their success, as compared with controls. These terms also reflect mature development and are a part of more comprehensive mind-brain development. Development of such attributes usually does not occur after reaching adulthood. Future research and training could thus explore mental techniques that may enhance inner development as a basis for continuous improvement and maintenance of top-level athletic performance.

Key words: sports performance, mental training, psychological development, fitness, Unified Theory of Performance, interview studies, Olympic athletes.