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Longitudinal analyses of the effects of mood on performance as a function of practice versus competition conditions: A season-long study of artistic roller skaters

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Abstract

A training champion is defined as someone who repeatedly fails in competition despite good results during training. In contrast, the competitor type is defined by not only being able to transfer his or her achievements from training to competition but often surpass them and achieve even better results in competition. The purpose of this study is to explore whether a training champion repeatedly differs from a competitor type in terms of mood before and after competition. Two top level artistic roller skaters participated in this season long case study. Findings indicated that, compared to the training champion, the competitor type repeatedly exhibited more activation, more calmness and less anger before and after competition. It was also found that the activation increased from earlier to later events for both training champion and competitor type. The level of arousal was less after competition compared to before competition for both skaters. The results have implications for both preparation and participation in highlight sport competitions for skaters and perhaps other athletes. Preparation strategies worthy of investigation include mood regulation to enhance activation and calmness and to reduce anger.

Keywords: Mood – Training Champion – Competitor Type – Elite Athletes - Success

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Introduction

In competitive sport the "training champion" is an athlete who repeatedly fails in competition despite good results during training. In contrast, the "competitor type" excels in not only transferring his or her achievements from training to competition, but possibly surpasses them and achieves even better results in competition (Gould & Damarjian, 1996; Taylor, 1996; Williams & Kranen, 1993). Barkhoff and Heiby (2004b) found that training champions and competitor types can be identified among artistic roller and figure skaters.

The purpose of this study was to investigate whether mood states differ between a training champion and competitor type elite artistic roller skater. Past research has shown mood to be related to sports performance abilities (Abele & Brehm, 1984) and competencies (Barkhoff, 2000; Terry, 1995), and consequently success (Skinner & Brewer, 2004). These findings are consistent with Morgan's mental health model of performance (Morgan, 1985; Morgan et al., 1988; Raglin & Morgan, 1994) and the so-called iceberg profile which postulate that ideal performance states are characterized by high levels of vigour and low levels of tension, depression, anger, fatigue and confusion.

The findings are also consistent with the mood-model by Thayer (1996) that posits predominant changes in self-regulation of mood from "tense-tiredness" to "calm-energy" in regard to successful performance. According to his model, all successful athletes in high competitive sports are expected to exhibit a "calm-energy" mood state before competition, which is characterized by strong activation and calmness. Activation and arousal should decrease after competition according to the so-called dis- and equilibration-effects (Brehm, 1997). Brehm posits a mood-disequilibration effects model saying that athletes' mood changes during the course of a competitive event. Activation and arousal mood states are expected to be more intense before competition compared to after competition. Brehm explains disequilibration as a state in which the former "normal" state of mood is irritated (e.g., by the anticipation of the competition performance), changed (rise of activation and arousal) and thereafter regulated to the

beginning state (equilibration). Thus, mood-disequilibration effects appear as fluctuations with peaks occurring before sport performances. Activation as well as arousal are posited to decrease after competition according to the dis- and equilibration effects. The dis- and equilibration effects are expected to be unrelated to the results and level of performance and the kind of sport.

While inspecting the effect of moods upon athletic performance Rowley et al. (1995) found limited use of the Profile of Mood States (POMS; Morgan, 1985; Morgan et al., 1988) in differentiating between successful and unsuccessful athletes whereas Terry (1995) indicated that scores on the POMS were capable of differentiating between successful and unsuccessful top-level athletes. Renger (1993) claims that in the study by Morgan and Pollock (1977) the POMS did successfully differentiate athletes from the nonathlete norms, but was unable to differentiate athletes of differing levels of ability (see also Beedie, Terry & Lane, 2000; LeUnes & Burger, 2000; Prapavessis, 2000; Terry, 2000). Furthermore, Terry & Lane (2000) proposed that the iceberg was a redundant concept as the normative mood profile is an "iceberg". These mixed findings may be due in part to the fact that the POMS does not measure calmness directly but nevertheless some investigators infer calmness from a low tension score. However, Barkhoff and Heiby (2004b) reported no significant mood differences between competitor type and training champion athletes in highlight sport competition. The method employed in their study assessed mood only once before and after training as well as before and after competition.

While some results evaluating the predictability of athletic success based upon mood are mixed, overall there is strong prospective evidence for the relation between mood and sports performance (Cockerill et al., 1991). Findings may be mixed because mood has not been measured sensitively (see Lowther & Lane, 2002) and because both training champion and competitor types of athletes are combined (Morgan & Johnson, 1978; Rowley et al., 1995). Given the dynamic nature of emotional states (Hill & Hill, 1991; Thayer, 1996), the mood of the two types of elite athletes in the present study were assessed over a whole season (approximately six months) directly before and after competition at three (for the training champion) and five (for the competitor type) skated competitions. According to previous findings (Barkhoff, 2000), the competitor type is

expected to report the situation of competition more as a challenge and the training champion more as a threat (see also Skinner & Brewer, 2002; Swain & Jones, 1992). Thus, according to the mood models indicated above (i.e., Morgan, 1985; Morgan et al., 1988; Thayer, 1996), the competitor type is expected to exhibit a mood state characterized by higher levels of activation and calmness, and lower levels of anger and arousal compared to the training champion.

Method

Participants

Two artistic roller skaters, members of the German national team, participated in the study. One skater was a 25 years old male skater who was categorized as a training champion. This athlete has been struggling for several years in transferring his training performance into his performance in competition. He has a history of meeting training but not competition goals set by him and his coach before the season. The other skater was a 21 year old female who was classified as a competitor type. She is known for performing similar to her training performance and often achieves even better results in competitions compared to her training. She became the World Champion and was able to defend her title in the following year in which she was also unbeaten. Both skaters participated in an earlier study (Barkhoff & Heiby, 2004b) in which they were classified by five expert judges. The classification of type of elite athlete was based on observation of the participants' past performance. The five experts (three licensed coaches, one international judge, and one coach who is also a licensed judge) are experts in judging elite athletes and had long-term knowledge about the skaters' performance. Experts classified the skaters into one of three groups: competitor type, training champion or mixed type. If four out of five experts judged the athlete as a particular type, the skater was so-classified for the purposes of hypothesis testing. Using this criterion, the female skater was classified as a competitor type and the male skater as a training champion. In the Barkhoff and Heiby study, the mood reported by elite skaters did not differ as a function of sex or age. Therefore, these demographic differences between the two skaters in the present study are not seen as a serious confound.

Both skaters were competing as "single skaters". While the competitor type participated only in "figure skating", the training champion also performed "free

skating". At the time of the investigation both skaters were members of the so-called "A-Kader" (National Team).

Materials

Mood was assessed with the "**Be**findlichkeits**f**ragebogen" (BEF-2; Kuhl, 1997), which is designed to measure situational mood. This German language inventory was developed according to the "activation-deactivation adjective check list" by Thayer (1989). The BEF-2 consists of 42 items (adjectives) with seven subscales. The items are rated on a four point Likert-scale. The BEF-2 is scored by summing individual item scores for each subscale. Higher scores reflect greater intensity of mood. For this study the following subscales were used: activation, anger, arousal, and calmness. The subscales have excellent internal consistency: activation (6 items) – alpha .85, anger (6 items) – alpha .85, arousal (6 items) – alpha .92, and calmness (6 items) – alpha .89 (Kuhl, 1997). Kuhl (personal communication, July, 21st, 2003) claims good construct validity with the Positive and Negative Affect Scale (Watson, et al., 1988) and the Activation-Deactivation Adjective Checklist (Thayer, 1989). Construct validity of the instrument also has been supported for the prediction of the relation between mood and performance among elite athletes during competition (Barkhoff & Heiby, 2004a) and for the discrimination of mood among elite athletes between training and competition (Barkhoff & Heiby, 2004b). In both studies, time effects for the BEF-2 mood subscales activation and arousal were found to be supportive of Brehm's mood-disequilibration effects model (Brehm, 1997). Using the BEF-2, Barkhoff and Heiby (2004a) also found support for the view that different states of mood are associated with different types of sports (e.g. creative sports versus endurance sports).

Procedure

The investigation took place at eighteen points of measurement for the training champion and ten points of measurement for the competitor type taking into account all skated competitions of both skaters during one season. The season lasted approximately six months. For both skaters the season started with the International German Cup in Artistic Roller Skating, followed by the Regional Artistic Roller Skating Championships. After that the competitor type participated in the South German Artistic Roller Skating Championships and the German National Artistic Roller Skating Championships. Both

skaters skated in the World Artistic Roller Skating Championships, the season's highlight. Table 1 shows skated competitions of both skaters during the whole season.

Table 1: Assessment of Mood at 18 Points in Time for the Training Champion and at 10 Points of Time for the Competitor Type

	TRAINING CHAMPION		COMPETITOR TYPE
International German Cup in Artistic Roller Skating			
t1	before figures	t1	before figures
t2	after figures	t2	after figures
t3	before short program		
t4	after short program		
t5	before long program		
t6	after long program		
Regional Artistic Roller Skating Championships			
t7	before figures	t3	before figures
t8	after figures	t4	after figures
t9	before short program		
t10	after short program		
t11	before long program		
t12	after long program		
South German Artistic Roller Skating Championships			
		t5	before figures
		t6	after figures
German National Artistic Roller Skating Championships			
		t7	before figures
		t8	after figures
World Artistic Roller Skating Championships			
t13	before figures	t9	before figures
t14	after figures	t10	after figures
t15	before short program		
t16	after short program		
t17	before long program		
t18	after long program		

The skaters were asked to fill out the BEF-2 before and after their performances in every competition. The length of time pre- and post- competition for questionnaire completion ranged from one to three minutes. Performance and result (place) of every competition were observed and documented. Performance was measured by a judges' catalogue of criteria (checklist) according to the "Artistic Roller Skating – Special

Regulations & Sport Rules" and "ISU - Judge's Manual Single Skating". This observational checklist assists a judge to identify and score prescribed elements. The checklist provides a score of difficulty for every possible jump, spin and footstep sequence. It also contains a point system for mistakes in performance (for example, falling down at a jump gives .4 point deduction for that element). The average of every jump, spin and the footstep sequence gives the overall score. While psychometric information on this behavioral checklist is not available, this instrument is commonly used by professional judges (Findlay & Ste-Marie, 2004; Looney, 2004). Checklist scores were used to rate performance as successful or unsuccessful by comparison of the overall scores given in training and in competition. Competition performances with lower scores compared to training scores were categorized as unsuccessful. Similar or superior scores in competition compared to training scores were categorized as successful.

Thus, it may be said that the expert-rated training champion repeatedly failed in competition but obtained good results during training. In contrast, the expert-rated competitor type was able to transfer her achievements from training to competition and even surpassed them in competition. The competitor type showed peak performances especially in important situations (e.g., World Championship). These findings provide an internal validity check of the classification of athletes, which is critical given that ratings at the competition were done without an inter-judge agreement evaluation. To prevent the athletes from being identified and ensure their anonymity the result (place) of every competition is not provided here.

The skaters were willing to fill out the questionnaires right before and after their performances in competition, which is considered to be very important taking into account that mood states to change over time. This is quite unusual knowing that most top athletes would not agree to be interrupted in this precarious situation of preparation just before an important competition. The first author knew both skaters well from his own sport experience, which may be one reason for their volunteering in spite of the aggravating circumstances of the study. They were also offered their individual results of the study, which could help them to discover and understand more about their behavior and possibly improve their future performance. It is important to note that the athletes received all of their results after the last championship at the end of the season. No results

were offered during the season which might have had an impact on their future performances during the season.

Data Analysis

Because there were only two skaters available for this study, the skater identification variable could not be treated as a random, and hence, no generalizations can be made to the population of skaters. In most studies, a random (or quasi-random) sample of individuals is obtained with the intent of generalizing the results to the population from which the sample was obtained. However, in this study, the population of individuals is restricted to those who can compete amongst the world's elite athletes, severely limiting the number available for sampling. With only two skaters in the sample, the skater variable was necessarily treated as a fixed effect (a variable in which all levels of interest are included and no generalizations to other levels are made).

However, although skater was treated as a fixed effect variable, the variable for event was not. Treating event as random variable implied that the events were the "subjects" of this study, and that our intent was to generalize our findings to the population of events, rather than to the population of skaters. For the analyses, the training champion and competitor type skaters were compared on the four subscales of the BEF-2 (activation, anger, arousal, and calmness) across several events, with each measure taken both before and after each event. Thus, there were repeated measurements taken from each event (skater and time), creating a repeated-measures design, which necessitated the use of a multilevel modeling procedure (Goldstein, 1995; Hox, 2002; Raudenbush et al., 2002).

Specifically, observations from one event are likely to be more similar than observations across events; and because standard statistical tests require that the assumption of independence of observations be met, these traditional methods could not be used here. If they were, then the estimates of the standard errors could be too small, and the results could be spurious. However, through multilevel modeling, the total variance can be partitioned into that from the observation level (Level 1) and that from the event level (Level 2). Hence, the problem of spurious standard errors is addressed.

Another benefit of the multilevel modeling design is that the observed data do not need to be balanced (i.e., measurement occasions are the same for each individual). In

this study, the measurements do not conform to a perfectly balanced design, as there were 18 points of measurement for the training champion and ten points of measurement for the competitor type. This again necessitated the need for these multilevel procedures. Detailed information on multilevel modeling can be found in several textbooks (Goldstein, 1995; Hox, 2002; Raudenbush et al., 2002).

A total of four models were run, with each differing in the outcome measure (the four subscales of the BEF-2). The predictor variables in each model were skater (competitor type vs. training champion), time (before event vs. after event), program (figure, short, or long) and date of the event. However, because the competitor type skater only participated in the figure program, the skaters were only compared for the figure program; and programs were only compared for the training champion. Note that because the data were not collected at equal intervals (e.g., observations every month), a time-series approach (e.g., auto- and cross-correlation functions) to the analyses was not appropriate.

Results

For the figure program, the competitor type skater reported significantly *higher* levels of activation and calmness, and a significantly *lower* level of anger, as compared to the training champion type skater (see Table 2). For both skaters the level of arousal after the event was significantly less than before the event. For the training champion, no differences across programs were found. Additionally, for both skaters, activation increased from earlier to later events [$t(1) = 2.12$; $p = .04$].

Table 2:

Multilevel Regression Model Results.

Outcome	Subject				Time			
	b	*S.E.*	*t*	*p*	*b*	*S.E.*	*t*	*p*
Activation	**2.30**	0.98	2.35	.03	– 1.00	0.86	– 1.16	.26
Anger	**– 4.45**	1.42	– 3.14	.01	2.44	1.27	1.92	.07
Arousal	0.29	0.88	0.33	.74	**– 4.22**	0.83	– 5.11	< .001
Calmness	**3.43**	1.35	2.53	.02	0.00	1.23	0.00	.99

Notes. Subject is coded as a zero for the training champion and one for the competitor type. *Time* is coded as zero for before the event and one for after the event. The statistics provided are *b* (regression coefficient), *S.E.* (standard error of the regression coefficient), *t* (*t*-value), and *p* (probability value). The degrees of freedom are 28 for each predictor in each model. Statistically significant results ($p < .05$) are shown in bold.

Discussion

The purpose of this study was to investigate whether mood states differ between a training champion and competitor type elite artistic roller skater. The training champion was defined as someone who repeatedly fails in competition in spite of good results during training. The competitor type was defined by not only being able to transfer his or her achievements from training to competition without any apparent problems but to surpass them and achieve even better results in competition.

As predicted, this study found that a training champion and a competitor type skater significantly differed in certain aspects of mood. It was found that, compared to the training champion, the competitor type repeatedly exhibited more activation, more calmness and less anger before and after competition. It was also found that the activation increased from earlier to later events for both training champion and competitor type. The level of arousal was less after competition compared to before competition for both skaters.

The results of the present study are consistent with Morgan's findings that ideal performance states are characterized partly by high levels of vigour and low levels of anger. They are also consistent with the mood model by Thayer (1996) that posits predominant changes in self-regulation of mood from "tense-tiredness" to "calm-energy" in regard to successful performance. The successful competitor type skater in this study exhibited repeatedly more activation and calmness before and after competition. Thus, the results are also consistent with previous findings by Barkhoff (2000) that the competitor type reports the situation of competition more as a challenge and the training champion more as a threat. In addition, the results of the present study concerning the subscales arousal are consistent with the so-called dis- and equilibration effects (Brehm, 1997). The level of arousal was less after competition compared to before competition for both skaters. The level of activation increased from earlier to later events for both training champion and competitor type which might be related to the increasing importance of the skated competitions culminating in the World Championships.

An important characteristic of this study is the idiosyncrasy of the data. The participants are both elite athletes who compete on an international scale, and one is the world champion. The population of these individuals is extremely small, negating any

possibility of large sampling. We have attempted to address this shortfall through the use of longitudinal assessment of the data, which allowed for an examination of the differences between the two athletes over an extended period of time. However, generalizability of the results from these two cases to the population of elite athletes cannot be demonstrated from this study alone.

Another limitation of this study was that the first author was the only judge in evaluating success of performance, which limited the internal validity check of the experts' classification of the athletes into types. Furthermore, it has to be taken into account that only a limited amount of psychometric information for the BEF-2 instrument used to assess moods is available.

In spite of the limitations of the study, the results suggest mood states before and after competition may differ significantly between a training champion and competitor type skater. As predicted, the competitor skater reported a more positive mood state characterized by more activation, more calmness and less anger compared to the training champion skater.

In conclusion, the results of the study support the view that differences in competitive achievement are at least partly attributable to situational mood (Morgan, 1985; Morgan et al., 1988). While the results did provide support for some of the study hypotheses, caution is needed when drawing conclusions regarding the implications. In regard to enhancement of performance at competitions (Gould et al., 1993; Landers, 1991; Prakash & Coplan, 2003) interventions and mental training programs might benefit by including strategies to self-regulate mood dimensions (Stevens & Lane, 2001). Our study suggests that these strategies should focus on enhancing activation and calmness and reducing anger through positive mood inducement and self-regulation training before and after competition.

REFERENCES

Abele, A., & Brehm, W. (1984). Befindlichkeitsveränderungen im Sport [Changes of Mood in Sport]. Sportwissenschaft, 3*, 252-275.*

Barkhoff, H. (2000). *Handlungskontrolle und Selbstkonzept(e) von Hochleistungssportlern im Roll- und Eiskunstlauf in Trainings- und Wettkampfsituationen* [Action Control and Self Concept(s) of top level Roller and Figure Skaters in Training and Competition]. Egelsbach: Hänsel-Hohenhausen.

Barkhoff, H., & Heiby, E.M. (2004a). Differences in Mood Among Elite Athletes in Artistic Roller, Artistic Figure and Inline Speed Skating Before and After Competition. *European Journal of Sport Science, 4*, 22-32.

Barkhoff, H., & Heiby, E.M. (2004b). Differences in Self-concept, Body-concept, and Mood between Training Champion and Competitor Type Athletes in Artistic Roller and Figure Skating. *Athletic Insight, 6. www.athleticinsight.com/Vol6Iss1/DifferencesinSelf-coneptBody-conceptMoodRollerFigureSkating.htm*

Beedie, J. C., Terry, P. C., & Lane, A. M., (2000). The profile of mood states and athletic performance two mete-analyses. *Journal of applied sport psychology,* 12 (1), 49-68.

Brehm, W. (1997). Äquilibration und Disäquilibration der Stimmung bei sportlichen Aktivitäten – Ergebnisse aus neuen Studien aus dem Bereich der Individualsportarten [equilibration and disequilibration effects during sport activities – results from current studies in individual sports]. In H. Ilg (Hrsg.), *Gesundheitsförderung. Konzepte, Erfahrungen, Ergebnisse aus sportpsychologischer und sportpädagogischer Sicht* (S. 202-208). Köln: bps-Verlag.

Cockerill, I.M., Nevill, A.M. & Lyons, N. (1991). Modeling mood states in athletic performance. *Journal of Sport Sciences, 9*, 205-212.

Findlay, L.C., & Ste-Marie, D.M. (2004). A Reputation Bias in Figure Skating Judging. Journal of Sport. *Journal of Sport and Exercise Psychology, 26*, 154-166.

Goldstein, H. (1995). *Multilevel Statistical Models*. New York: Halstead Press.

Gould, D., & Damarjian, N. (1996). Imagery Training for Peak Performance. In J. L. Van Raalte & B. W. Brewer (ed.). *Exploring sport and exercise psychology* (pp. 25-50).Washington, DC: American Psychological Association.

Gould, D., Finch, L. M., & Jackson, S. A. (1993). Coping strategies used by champion figure skaters. *Research quarterly for exercise and sport, 64*, 453-468.

Hill, C.M., & Hill, D.W. (1991). Influence of time of day on responses to the Profile of Mood States. *Perceptual and Motor Skills, 72*, 434-439.

Hox, J. J. (2002). *Multilevel Analysis: Techniques and Applications*. Mahwah, NJ: Lawrence Erlbaum Associates.

Kuhl, J. (1997). *BEF-2 – Befindlichkeitsfragebogen* [BEF-2 – Moodscale]. Unpublished.

Landers, D.M. (1991). Optimizing individual performance. In D. Druckman & R.A. Bjork (Eds.), *In the mind`s eye: Enhancing human performance* (pp. 193-246). Washington, DC: National Academy Press.

LeUnes, A., & Burger, J., (2000). Profile of mood states research in sport and exercise psychology: Past, present, and future. *Journal of applied sport psychology,* 12 (1), 5-15.

Looney, M.A. (2004). Evaluating Judge Performance in Sport. *Journal of Applied Measurement, 5(1),* 31-47.

Lowther, J., & Lane, A.M. (2002). Relationships between mood, cohesion and satisfaction with performance among soccer players. Athletic Insight, 4. *www.athleticinsight.com/Vol4Iss3/MoodandPerformance.htm*

Morgan, W.P. (1985). Affective beneficence of vigorous physical activity. *Medicine and Science in Sport and Exercise, 17*, 94-100.

Morgan, W.P., Costill, D.L., Flynn, M.G., Raglin, J.S. & O`Connor, P.J. (1988). Mood disturbance following increased training in swimmers. *Medicine and Science in Sport and Exercise, 20*, 408-414.

Morgan, W.P., & Johnson, R.W. (1978). Personality characteristics of successful and unsuccessful oarsmen. *International Journal of Sports Psychology, 9*, 119-133.

Morgan, W.P., & Pollock, M.L. (1977). Psychologic Characterization of the elite distance runner. *Annals of the New York Academy of Sciences, 301*, 383-403.

Prakash, K., & Coplan, R.J. (2003). Shy skaters? Shyness, coping, and adjustment outcomes in female adolescent figure skaters. *Athletic Insight, 5. www.athleticinsight.com/Vol5Iss1/ShySkaters.htm*

Prapavessis, H., (2000). The poms and sports performance: A review. *Journal of applied sport psychology,* 12 (1), 34-48.

Raglin, J. S., & Morgan, W. P., (1994). Development of a scale for use in monitoring training-Induced distress in athletes. *International journal sports medicine,* 15 (2), 84-88.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods*. London: Sage Publications.

Renger, R. (1993). A Review of the Profile of Mood States (POMS) in the Prediction of Athletic Success. *Journal of Applied Sport Psychology, 5*, 78-84.

Rowley, A.J., Landers, D.M., Kyllo, L.B. & Etnier, J.L. (1995). Does the iceberg profile discriminate between successful and less successful athletes? *Journal of Sport and Exercise Psychology, 17*, 185-199.

Singer, J. D., & Willett, J. B. (2003). *Applied Longitudinal Data Analysis*. New York: Oxford University Press.

Skinner, N., & Brewer, N. (2002). The dynamics of threat and challenge appraisals prior to stressful achievement events. *Journal of Personality and Social Psychology, 83*, 678-692.

Skinner, N., & Brewer, N. (2004). Adaptive Approaches to Competition: Challenge Appraisals and Positive Emotion. *Journal of Sport and Exercise Psychology, 26*, 283-305.

Stevens, M.J., & Lane, A.M. (2001). Mood-regulating strategies used by athletes. *Athletic Insight, 3. www.athleticinsight.com/Vol3Iss3/MoodRegulation.htm*

Swain, A.B.J., & Jones, g. (1992). Relationships between sport achievement orientation and competitive state anxiety. *The Sport Psychologist, 6*, 42-54.

Taylor, J. (1996). Intensity and athletic performance. In J. L. Van Raalte & B. W. Brewer (Eds.), *Exploring sport and exercise psychology*. (pp. 75 – 106).

Terry, P. (1995). The efficacy of mood state profiling with elite performers: A review and synthesis. *The Sport Psychologist, 9*, 309-324.

Terry, P. (2000). Introduction to the special issue: Perspectives on mood in sport and exercise. *Journal of sport psychology,* 12, 1-4.

Terry, P., & Lane, A. M., (2000). Normative values for the profile of mood states for use with athletic samples. *Journal of applied sport psychology,* 12 (1), 93-109.

Thayer, R-E. (1989). *The biopsychology of mood and arousal*. New York: Oxford University Press.

Thayer, R.-E. (1996). *The origin of everyday moods. Managing energy, tension, and stress*. New York: Oxford University Press, Inc.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063-1070.

Williams, J. M., & Kranen, V. (1993). Psychological characteristics of peak performance. In J. M. Williams (Ed.), *Applied sport psychology: Personal growth to peak performance* (pp. 137-147). Mountain View, CA: Mayfield