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Mood-Regulation Intervention: Two Season Long Case Study of a Training Champion vs. a Competitor Type Athlete in Artistic Roller Skating

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Abstract

The purpose of this case study was to explore the effectiveness of a mood-regulation intervention program conducted with a formerly unsuccessful training champion artistic roller skating athlete. In a prior study by Barkhoff, Pagano & Heiby (2007) with two top level artistic roller skaters, it was found that the training champion repeatedly exhibited less activation, less calmness and more anger compared to the competitor type. In the current follow-up case study of the same athletes, the training champion received a mood-regulation intervention program before and during the second season while the competitor type received no intervention. Findings showed that the training champion did not differ from the competitor type anymore on measures of activation, calmness, and anger. The training champion also was more successful than during the first season insofar as the training champion was more likely to transfer performance from training to competition, and earned a medal during the second season. The findings are limited to the two individuals investigated. However, the results might have implications for techniques to regulate mood for both preparation and participation in competitive sports.

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

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Mood-Regulation Intervention: Two Season Long Case Study of a Training Champion vs. a Competitor Type Athlete in Artistic Roller Skating

Introduction

Differences in competitive achievement between an unsuccessful training champion (Barkhoff & Heiby, 2004a) and a successful competitor type (Barkhoff, Pagano, & Heiby, 2007) seem at least partly attributable to situational mood (Morgan, 1985; Morgan et al., 1988). According to Barkhoff & Heiby (2004b) a “training champion” (TC) is an athlete who repeatedly fails in competition despite good results during training (Tschakert, 1987). In contrast, the “competitor type” (CT) excels in not only transferring his or her achievements from training to competition, but possibly surpasses them and achieves even better results in competition by showing his or her peak performance (Gould & Damarjian, 1996; Taylor, 1996; Williams & Kranen, 1993). Barkhoff & Heiby (2004b) found that TCs and CTs can be identified in competitive elite artistic roller and figure skaters. In a season long case study (Barkhoff et al., 2007), it was also found that some of the differences were attributable to situational mood in terms of activation, calmness and anger before and after competition. In addition, it has been proposed that in regards to enhancement of performance (Gould et al., 1993; Landers, 1991; Prakash & Coplan, 2003) at competitions, interventions such as mental training programs might benefit by including strategies to self-regulate mood (Stevens & Lane, 2001). The Barkhoff et al. (2007) study suggests that these strategies should focus on enhancing activation and calmness, and reducing anger through positive mood inducement and self-regulation training.

The purpose of this study was to investigate the effectiveness of a mood-regulation intervention program conducted with the unsuccessful TC athlete of the Barkhoff et al. (2007) study. The mood-regulation intervention program was incorporated in his daily training during off-season and continued during season. It focused on enhancing activation and calmness, as well as reducing anger. Effectiveness of the mood-regulation intervention for the TC was measured in terms of mood scores (activation, calmness, anger, and arousal) and performance scores during the first season (prior to the intervention; Barkhoff et al., 2007) and the second season (during and after the

intervention). Effectiveness of the intervention upon performance also was measured in terms of whether the TC earned a medal at a major competition during the second season, given he had not earned a medal during the first season. For skaters on this elite level (National Team) a major competition is an international competition such as the World Championships, the season's highlight.

Hypotheses.

Hypothesis 1: The TC was expected to not differ during the second season compared to the CT in regard to activation, calmness, and anger mood scores. These mood scores for the TC and CT had differed significantly during the first season (Barkhoff et al., 2007).

Hypothesis 2: Arousal scores between the two athletes did not differ significantly during the first season (Barkhoff et al., 2007). Therefore, it was expected that the TC would continue to not differ from the CT in regard to arousal mood scores.

Hypothesis 3: Arousal mood states were more intense before competition compared to after competition (i.e., mood-disequilibrium effects; Brehm, 1997) for both skaters during the first season (Barkhoff et al., 2007). Because these effects are believed to be independent from performance outcome, we expected to find mood-disequilibrium effects also in the second season for both skaters.

Hypothesis 4: The TC's performance was expected to improve compared to the prior season in terms of generalizing success from training to competition by reaching similar overall performance scores in training compared to competition.

Hypothesis 5: The TC's performance was also expected to earn the TC at least one medal at a major championship competition during the second season.

Method

Participants

Participants were the same two artistic roller skaters, members of the German national team, who participated in the Barkhoff et al. (2007) study. One skater was a 26 year old male who was categorized as a TC. This athlete has been struggling for several years in transferring his training performance to his performance in competition. The TC had a history of meeting training but not competition goals set by him and the coach before the season. The other skater was a 22 year old female who was classified as a CT.

The CT is known for performing similar to her training performance and often achieving even better results in competitions compared to training. The CT became the World Champion during data collection of the Barkhoff et al. (2007) study. Both skaters participated also in an earlier study (Barkhoff & Heiby, 2004b) in which they were classified by five expert judges. The classification of type of elite athlete in that study was based on observation of the participants' past performance before the intervention. The five judges (three licensed coaches, one international judge, and one coach who is also a licensed judge) were experienced in judging elite roller skating athletes and had long-term knowledge about the skaters' performance. The judges classified the skaters into one of three groups: CT, TC, 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. By using this criterion, the female skater was classified as a CT and the male skater as a TC. The two athletes' classifications were replicated during the Barkhoff et al. (2007) study.

In the Barkhoff & Heiby (2004b) 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 Barkhoff et al. (2007) and the current study are not seen as a serious confound.

Both participants were competing as "single skaters". While the CT participated only in "figure skating" during competitions, the TC also performed "free skating". Usually all skaters perform figure and free skating during practice, however, more and more athletes are focusing on either one for their competition. During the Barkhoff et al. (2007) study and the current study both skaters were members of the so-called "A-Kader" (National Team).

Materials

Mood. Like in the Barkhoff et al. (2007) study, mood was assessed with the "Befindlichkeitsfragebogen" (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 of the seven subscales.

Higher scores reflect greater intensity of that mood state. In both years of data collection for the two participants, the following four subscales were used: activation, anger, arousal, and calmness. The subscales have good 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 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 also has been supported for the prediction of the relation between mood and performance among elite athletes during competition (Barkhoff & Heiby, 2004a) as well as 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-disequilibrium effects model (Brehm, 1997) indicating fluctuations with peaks before performance and lows after performance and thus providing construct validity support. Using the BEF-2, Barkhoff & Heiby (2004a) also found construct validity support insofar as different states of mood were associated with different types of sports (e.g. creative sports versus endurance sports).

Performance. Performance scores of every competition were observed and documented according to the judges' catalogue of criteria (checklist), the "Artistic Roller Skating – Special Regulations & Sport Rules". This observational checklist assists judges to identify and score prescribed elements by providing a score of difficulty for every possible jump, spin and footstep sequence. It also contains a point system for mistakes in performance of elements (for example, falling down at a jump gives .4 point deduction for that element). The average of every jump, spin and footstep sequence results in the overall score. While psychometric information on this behavioral checklist is not available, this kind of instrument is commonly used by professional judges in artistic roller skating as well as figure skating (Findlay & Ste-Marie, 2004; Looney, 2004). Checklist scores given in training and in competition were calculated to an overall score for each skater for training and competition performances. Performance outcome also was measured in terms of medals won at a major international competition by the TC during the second season at either the International German-Cup or the World Championships.

Procedure

The procedure of the current study was a replication of the Barkhoff et al. (2007) study of the first season with the exception that the TC had received a mood regulation intervention between seasons and during the second season. The CT received no such intervention.

Mood-Regulation Intervention

Strategies to enhance activation were incorporated in the TC's warm up program by using imagery of past successfully performed elements of the program, such as triple jumps, spins, and footsteps. Calmness was addressed by focusing on specific technical parts of an element in order to prevent overarousal mostly experienced by the athlete right before the start of a competition. Self-talk was used to help the athlete reduce his anger, in particular after an unsuccessful performance of a certain element. First the athlete was asked to report something positive about each performed element right after its performance. While usually focusing on the negative aspects of his performance, the athlete showed difficulties in providing positive thoughts on failed attempts in the beginning. However, over time he learned to not only focus on the outcome of an element (like a triple jump and possibly falling down) but also certain technical aspects which might have been improved. His positive statement after each element apparently replaced his negative thought, which presumably was de-structured. Whereas the athlete was known for giving up and getting angry after a short amount of time after several failures, he over time became more persistent and open to criticism from the coach. However, while the improvement during training was observable, it was still unknown if he was able to transfer his "new" skills into competition. Therefore, data of his mood before and after competition were again collected during the next season, and compared to the CT athlete who participated also in the Barkhoff et al. (2007) study. Transfer of skills was also assessed in terms of performance scores during competition.

In the Barkhoff et al. (2007) and the current study, and therefore in both years, the investigation took place at eighteen points of measurement for the TC and ten points of measurement for the CT, resulting in thirty-six points of measurement for the TC and twenty points of measurement for the CT overall. Thereby all skated competitions of both skaters during both seasons were taken into account. Each season lasted approximately

six months. For both skaters each season started with the International German Cup in Artistic Roller Skating, followed by the Regional Artistic Roller Skating Championships. However, the TC did not participate in the Regionals in the second season but instead participated in the Nationals. After the Regionals the CT participated in the South German Artistic Roller Skating Championships and the German National Artistic Roller Skating Championships in both years. Both participants also skated in the World Artistic Roller Skating Championships, the season's highlight, in both years. Tables 1 and 2 show skated competitions of both skaters during each season.

The skaters were asked to fill out 24 items of the BEF-2 before and after their performances in every skated competition of both seasons. 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 according to the judges' catalogue of criteria (checklist), the "Artistic Roller Skating – Special Regulations & Sport Rules".

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 change over time (Hill & Hill, 1991). Their willingness to participate in spite of the aggravating circumstances 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 like a World Championship.

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

TRAINING CHAMPION	COMPETITOR TYPE
Season One	
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	

Notes. t = time

From “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” by H. Barkhoff, I. Pagano & E. Heiby, 2007, *Journal of the American Board of Sport Psychology*, 1, p. 1 – 14, Copyright 2007 by JABSP. Adapted with permission.

Table 2: Assessment of Mood at 18 Points in Time for the Training Champion and at 10 Points of Time for the Competitor Type in Season 2

TRAINING CHAMPION	COMPETITOR TYPE
Season Two	
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	
	t3 before figures
	t4 after figures
South German Artistic Roller Skating Championships	
	t5 before figures
	t6 after figures
German National Artistic Roller Skating Championships	
t7 before figures	t7 before figures
t8 after figures	t8 after figures
t9 before short program	
t10 after short program	
t11 before long program	
t12 after long program	
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	

Note. t = time

Data Analysis

Mood data were analyzed according to the statistical procedures used in the Barkhoff et al. (2007) study. Because there were only two skaters available for this study, the skater identification variable could not be treated as random, and therefore, no generalizations can be made to the population of skaters. Usually 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 the Barkhoff et al. (2007)

study and the current 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 had to be treated as a fixed effect (a variable in which all levels of interest are included and no generalizations to other levels are made).

However, while 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 actual "subjects" of the Barkhoff et al. (2007) and the current study, and that the intent was to generalize the findings to the population of events, rather than to the population of skaters. For the analyses, the TC and CT skaters in both studies were compared on the four subscales of the BEF-2 (activation, anger, arousal, and calmness) across all skated events, with each measure taken both before and after each event. Thus, there were repeated measurements taken from each event (skater and time). This is 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 in both studies involving these same two skaters. If standard statistical tests were used, 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). This way the problem of spurious standard errors is addressed.

An additional benefit of the multilevel modeling design is that the observed mood data do not need to be balanced (i.e., measurement occasions are the same for each individual). In both studies, the measurements do not conform to a perfectly balanced design, as there were 18 points of measurement for the TC and ten points of measurement for the CT in each study. This again necessitated the need to use these multilevel procedures. Detailed information on multilevel modeling can also be found in several textbooks (Goldstein, 1995; Hox, 2002; Raudenbush et al., 2002).

In both the Barkhoff et al. (2007) and the present study, and therefore in two seasons, a total of four models were run to test Hypotheses 1, 2, and 3 regarding mood states. Each model differed in the outcome measure (i.e., scores on the four subscales of the BEF-2 designed to measure activation, calmness, anger, and arousal). The predictor variables in each model were skater (CT vs. TC), time (before event vs. after event), program (figure, short, or long) and date of the event. However, because of the fact that the CT skater only participated in the figure program, the skaters were only compared for the figure program; and programs were only compared for the TC. It is important to 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.

Performance was analyzed by calculating an overall score for each skater for each of the competitions, including the last training before the competition. Including training and competition performance per season, there were three competitions for the TC and five competitions for the CT. However, for a figure competition every skater has to perform four different "figures": three "straights" and one "loop". For each "figure" every judge can give up to ten points. A ten is the highest score and indicates perfect performance, which is rarely given. In each competition there are different numbers of judges. Thus, we calculated an average score for each figure from all the judges. This way four scores for each skater for the four figures skated and judged resulted in an overall score. With this calculation, an overall score 40 would have been a perfect ten for each of the four figures. Performance scores were analyzed with a standard mixed (both between- and within-subjects variables) ANOVA model. The performances scores were the dependent variable. Skater (TC vs. CT), season (first season; before intervention vs. second season; after intervention), time (training vs. competition), and the interactions between them were the independent variables. Skater and season were between-subjects variables and time was within-subjects. As in the multilevel models used for the mood data, the "subjects" in these analyses were the events. The two skaters were treated as a fixed-effect independent variable, and therefore the results cannot be generalized beyond these two individuals.

Performance in terms of winning a medal at a major competition, such as the International German-Cup or the World Championship also was recorded for each athlete. However, to prevent the athletes from being identified and ensure their anonymity, the judge’s scores and results (places) of every competition are not reported.

Results

In the first season (Barkhoff et al., 2007), the CT skater reported significantly higher levels of activation and calmness, and a significantly lower level of anger, as compared to the TC type skater (see Table 3).

Table 3:

Multilevel Regression Model Results for Season 1.								
OUTCOME	SKATER				TIME			
	<i>b</i>	<i>S.E.</i>	<i>T</i>	<i>p</i>	<i>b</i>	<i>S.E.</i>	<i>t</i>	<i>p</i>
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. Skater 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.

From “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” by H. Barkhoff, I. Pagano & E. Heiby, 2007, *Journal of the American Board of Sport Psychology*, 1, p. 1 – 14, Copyright 2007 by JABSP. Adapted with permission.

However, in the second season the TC did not differ anymore from the CT athlete on scales of activation, calmness, and anger. However, the TC differed from the CT in regard to arousal mood scores during the second season whereas the TC did not in the first season. As during the first season, in the second season for both skaters the level of arousal after the event was significantly less than before the event (see Table 4).

Table 4:

Multilevel Regression Model Results for Season 2.								
OUTCOME	SKATER				TIME			
	<i>b</i>	<i>S.E.</i>	<i>t</i>	<i>P</i>	<i>b</i>	<i>S.E.</i>	<i>t</i>	<i>p</i>
Activation	-0.74	0.94	-0.79	.44	-1.23	0.90	-1.37	.19
Anger	-1.05	1.12	-0.94	.36	2.15	1.09	1.98	.06
Arousal	1.96	0.84	2.33	.03	-4.23	0.82	-5.17	< .001
Calmness	1.54	0.94	1.63	.12	-0.08	0.92	-0.08	.93

Notes. *Skater* 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.

A standard mixed ANOVA revealed a significant performance improvement for the TC (see Tables 5 and 6) from the first season (before intervention) to the second season (after intervention), also indicated by an interaction effect (see also Figures 1 and 2).

Table 5:

Performance Score Means and Standard Deviations.					
SEASON	SKATER	EVENT TYPE	<i>N</i>	<i>Mean</i>	<i>s</i>
1	TC	Training	3	37.2	0.86
1	TC	Competition	3	35.1	0.91
1	CT	Training	5	38.0	0.62
1	CT	Competition	5	38.7	0.26
2	TC	Training	3	38.2	0.80
2	TC	Competition	3	37.1	1.08
2	CT	Training	5	37.9	1.04
2	CT	Competition	5	38.4	0.72

Notes. The *Skater* variable includes the training-champion (TC) and the competitor-type (CT). The number of events (*n*) observed for each mean and standard deviation (*s*) is shown.

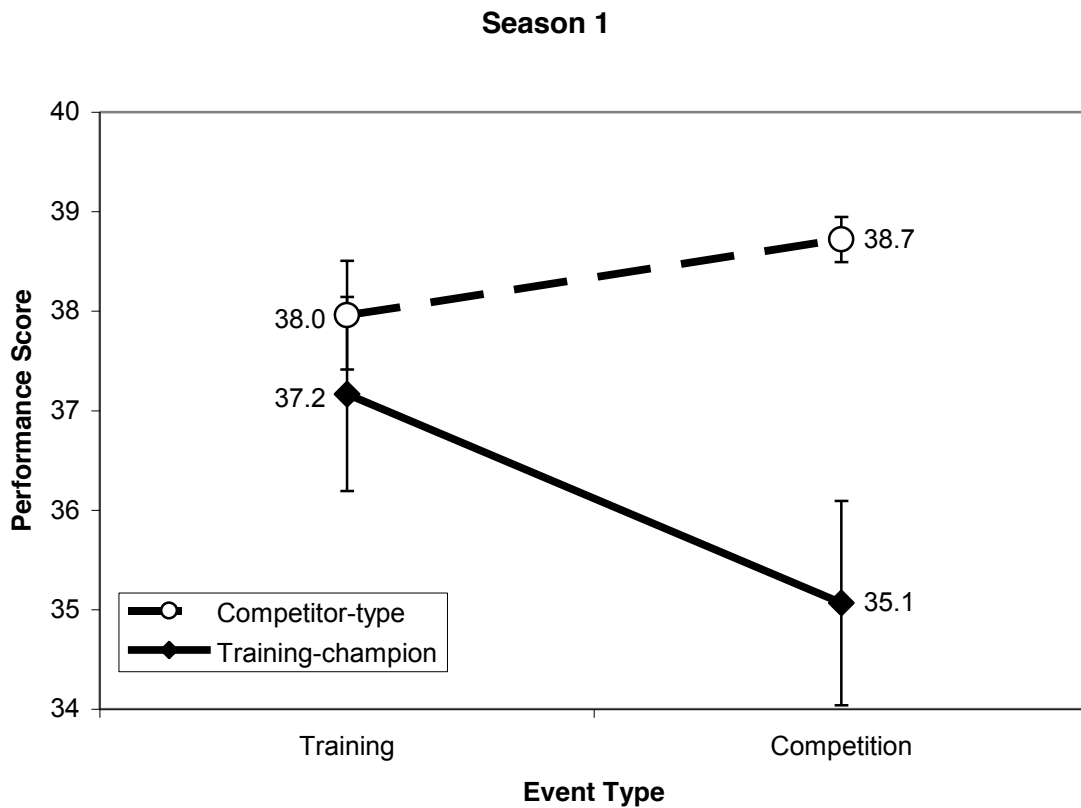
Table 6:

ANOVA Source Table for Performance Score Analyses.					
SOURCE	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Skater	1	13.97	13.97	15.0	0.002
Season	1	2.89	2.89	3.1	0.10
Skater*Season	1	5.53	5.53	5.9	0.03
Event Type	1	1.46	1.46	4.6	0.05
Skater*Event Type	1	9.44	9.44	29.6	0.0001
Season*Event Type	1	0.28	0.28	0.9	0.36
Skater*Season*Event Type	1	0.71	0.71	2.2	0.16

Note. The degrees of freedom (*df*), sum of squares (*SS*), mean squares (*MS*), F-ratios (*F*), and p-values (*p*) are shown. Statistically significant ($p < .05$) sources are shown in bold.

Figure 1:

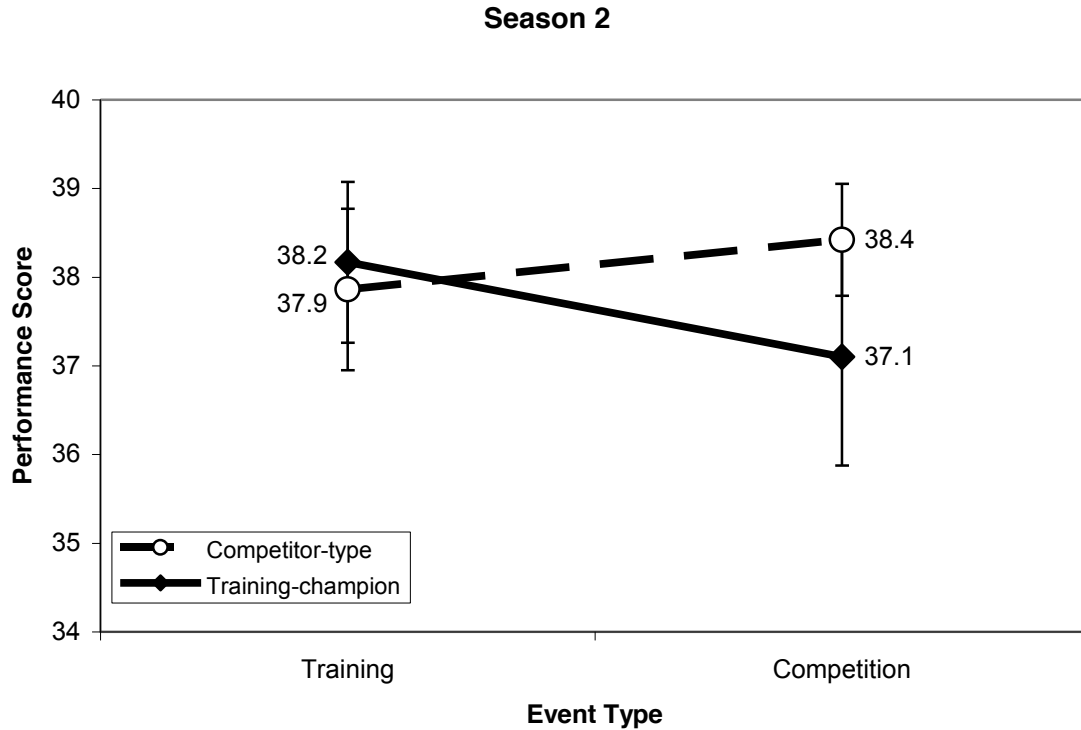
Performance score means for Season 1 as a function of Skater type.



Note. The error bars show the 95% confidence limits for each performance score mean.

Figure 2:

Performance score means for Season 2 as a function of Skater type.



Note. The error bars show the 95% confidence limits for each performance score mean.

Finally, the TC won a medal at the World Championship competition during the second season whereas he did not win a medal in the season before the intervention. In contrast, the CT was unbeaten during both seasons winning all competitions including two times the World Championship title resulting in ten medals in ten skated competitions for both years.

Discussion

This case study reports mood and performance data for two elite artistic roller skaters across two seasons of competition. One skater was classified as a TC because the skater repeatedly failed in competition in spite of good results during training. The other skater was classified as a CT because this skater repeatedly was able to transfer the achievements from training to competition and sometimes surpass them in competition.

During the first season (Barkhoff et al. 2007), the TC exhibited less activation, less calmness and more anger compared to the CT. Between seasons and during the second season, the TC underwent a mood-regulation intervention. Preliminary support for the intervention was found insofar as activation, calmness, and anger scores no longer differed between the two athletes during the second season. Moreover, the performance of the TC improved during the second season compared to the first season.

The mood-regulation intervention program for the TC was conducted during the athlete's warm up program off-season as well as during season. Imagery strategies were used to enhance activation. Calmness was induced by instructing the athlete to focus on specific technical parts of an element. Self-talk was used to help the athlete reduce his anger.

The first three hypotheses concerned the effect of the mood-regulation intervention for the TC upon activation, calmness, anger, and arousal mood scores (Tables 3 and 4). As predicted in Hypothesis 1, this study found that after a mood-regulation intervention program, the TC and the CT skater did not differ anymore on activation, calmness and anger scores before and after competition. A mood state of higher levels of activation and calmness, and lower level of anger in association to successful performances is consistent with mood models of Morgan (1985), Morgan et al., (1988), and Thayer (1989). However, contrary to the Hypothesis 2 prediction, the TC differed in terms of less arousal compared to the CT, which might be attributable to the reduction of activation. It was also found that, similar to the Barkhoff et al. (2007) study, the level of arousal was less after competition compared to before competition for both skaters, supporting Hypothesis 3. This finding is consistent with the so-called dis- and equilibration effects (Brehm, 1997).

The fourth and fifth hypotheses concerned the effect of the mood-regulation intervention upon performance. Hypothesis 4 was supported insofar as the TC's performance was more likely to transfer from training to competition during the second season compared to the first season (Table 6, Figures 1 and 2). Additionally, both skaters were able to show similar performances in competition compared to training in all competitions for the CT (100%), and all but one competition (66.67%) for the TC resulting in a significant performance improvement in terms of similar overall scores in

training compared to competition. Note that the TC did not receive a similar or superior score in competition compared to training in any of the competitions (0%) during the first season. However, the TC was more successful compared to the prior season in terms of winning a medal at the World Championship competition. The TC did not win a medal in the first season, whereas the CT became World Champion in both years under investigation. The effect of mood change upon performance of the TC is consistent with prior findings (Barkhoff & Heiby, 2004b).

Of course, these findings must be viewed within the limitations of the case study. There were only two subjects participating in the study and both were willing to complete a questionnaire prior to and after each competition. However, both are elite athletes who compete on an international scale, and one is a World Champion during both seasons under investigation (Barkhoff et al., 2007 and the current study). Thus, 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, and using data of a former study (Barkhoff et al., 2007), which allowed for an examination of the differences between the two athletes over a period of almost two years. However, generalizability of the results from these two cases to the population of elite athletes cannot be demonstrated. Furthermore, scores from different competitions where one athlete participated and another did not, were compared, which might have introduced confounds regarding difficulty of each competition. Another limitation is that only a limited amount of psychometric information for the BEF-2 instrument used to assess moods is available. Finally, the mood-regulation intervention has not yet been subjected to internal validity checks or randomized clinical trials (e.g., with amateur skaters including a wait-list control and a placebo intervention).

In spite of the limitations of the study, the results suggest that a mood-regulation intervention program might be effective when tailored to the needs of an individual TC type of athlete, and implemented while training during off-season as well as throughout the competitive season. Hanton & Jones (1999a,b) used a comparable approach including the skills of goal setting, imagery, and self-talk to interpret and deal with pre-performance cognitive and somatic anxiety symptoms (see also Jones, 1995) in swimming. However, their studies compared elite performers to non-elite performers

whereas the current study compares two elite athletes in artistic roller skating both competing on an international scale. Furthermore, in the current study the intervention was aimed to regulate mood states according to previous mood and performance findings of a particular athlete. As predicted, the TC who received the intervention did not differ in regard to activation, calmness and anger compared to the CT skater, as was the case in the prior season (Barkhoff et al., 2007). He also was more successful in transferring his achievements from training to competition in all but one competition (66.67%), resulting in a significant performance improvement in terms of overall performance scores, and winning a medal at the World Championship competition. Data from additional seasons would indicate whether his mood regulation skills and improved performance would lead to his being classified as a CT rather than a TC.

REFERENCES

- 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-conceptBody-conceptMoodRollerFigureSkating.htm
- Barkhoff, H., Pagano, I., & Heiby, E.M. (2007). 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. *Journal of the American Board of Sport Psychology*, 1, 1 – 14,
www.americanboardofsportpsychology.org/Portals/24/ABSP-JournalBarkhoff1.pdf
- Beedie, J. C., Terry, P. C., & Lane, A. M. (2000). The profile of mood states and athletic performance two meta-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.
- Findlay, L.C., & Ste-Marie, D.M. (2004). A Reputation Bias in Figure Skating Judging. *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.
- Hanton, S., & Jones, G. (1999a). The acquisition and development of cognitive skills and strategies in elite swimmers: I. Making the butterflies fly in formation. *The Sport Psychologist*, *13*, 1-21.
- Hanton, S., & Jones, G. (1999b). The effects of a multimodal intervention program on performers: II. Training the butterflies to fly in formation. *The Sport Psychologist*, *13*, 22-41.
- 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.
- Jones, G. (1995). More than just a game: research developments and issues in competitive anxiety in sport. *British Journal of Psychology*, *86*, 449-478.
- 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.
- Looney, M.A. (2004). Evaluating Judge Performance in Sport. *Journal of Applied Measurement*, *5*(1), 31-47.
- 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.
- 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
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods*. London: Sage Publications.
- Stevens, M.J., & Lane, A.M. (2001). Mood-regulating strategies used by athletes. *Athletic Insight*, *3*. www.athleticinsight.com/Vol3Iss3/MoodRegulation.htm
- Taylor, J. (1996). Intensity and athletic performance. In J. L. Van Raalte & B. W. Brewer (Eds.), *Exploring sport and exercise psychology*. (pp. 75 – 106).
- Thayer, R-E. (1989). *The biopsychology of mood and arousal*. New York: Oxford University Press.
- Tschakert, R. (1987). Trainingsweltmeister – Was tun? Psychoregulationstraining eines Tennisspielers [Training champion – what to do? Self-regulation training of a tennisplayer]. *Sportpsychologie*, *1*, 14-17.
- 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.